NLGI Spokesman

Journal of National Lubricating Grease Institute

Made with the skill that assures protection

This breastplate is a product of skillful 16th Century armor-making. The expert fitting and forming of this sturdy garment permit all the necessary mobility, while the superb carving and embossment reveal it as a true work of art. And most important of all, the studied design and careful workmanship assure maximum protection to the wearer.

Jones & Laughlin Steel Containers provide dependable protection for your products. They are built of sturdy, high-quality J&L Steel Sheet. Careful manufacture assures accuracy in all fittings and closures. J&L containers have a trim appearance which can be decorated attractively with colorful designs and illustrations by means of J&L's lithographic process.

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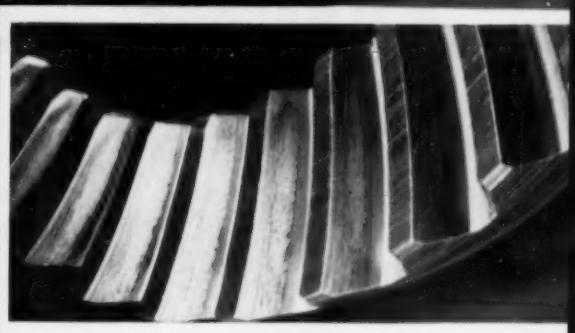
Today's Gear Lubricants Will Pass Tomorrows Indicated Requirements when treated with COM-PLUS 77

COM-PLUS 77 Multi-Purpose Gear Lubricant Concentrate... a controlled activity compound, designed to give guaranteed maximum E.P. performance.

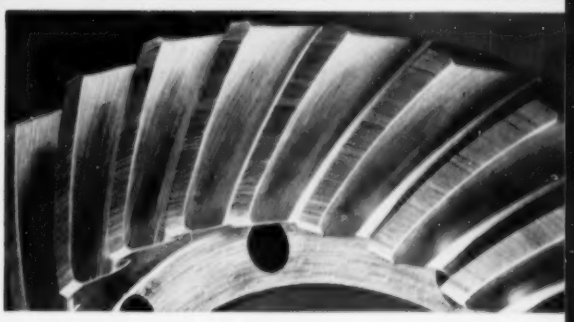


Drive Side
High-Speed
High-Torque
test results

These photos tell a story of outstanding performance . . .

The gears shown here were lubricated with SAE 90 Gear Oil treated with Com-Plus 77. In repeated cycling tests (by neutral laboratory) under high speed, high torque conditions the results exceeded all current military, industrial and automotive engineering requirements with flying colors.

Note original tool marks on gears even after this grueling test.



Coast Side
High-Speed
High-Torque
test results

Check these important factors

- Chlorine Free
- Non-Rusting
- Non-Corrosive
- Lead Soap-Free, No Precipitation
- Low Wear
- Substantial Viscosity Index Improvement
- Controlled Activity of Ingredients

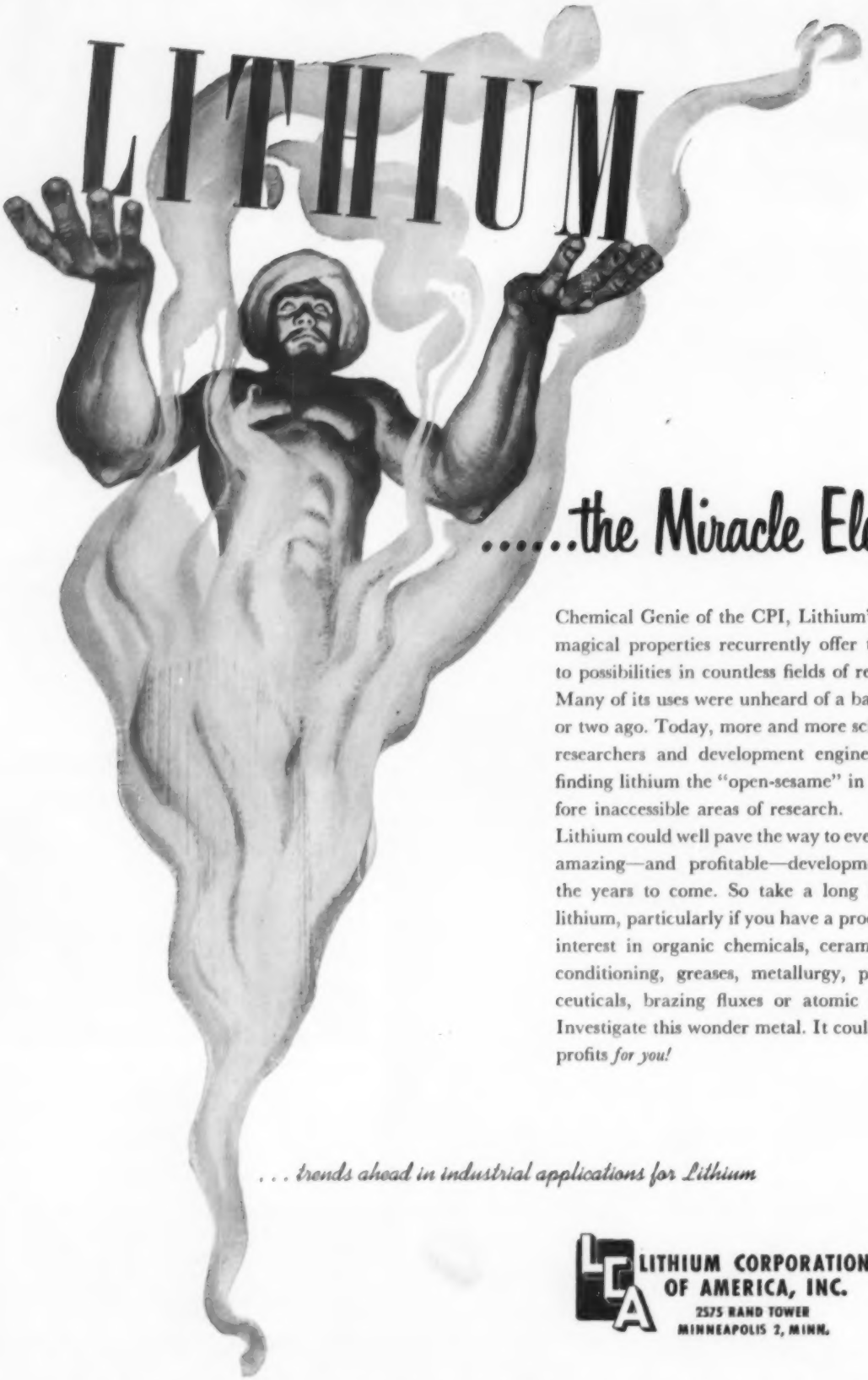
Commerce

COMMERCE CHEMICAL CORPORATION

WARREN, PENNSYLVANIA, U.S.A.

Direct Inquiries to our New York Sales Office: 515 Madison Avenue, Dept. J, New York 22, N. Y.

LITHIUM



.....the Miracle Element

Chemical Genie of the CPI, Lithium's near-magical properties recurrently offer the key to possibilities in countless fields of research. Many of its uses were unheard of a bare year or two ago. Today, more and more scientists, researchers and development engineers are finding lithium the "open-sesame" in heretofore inaccessible areas of research.

Lithium could well pave the way to even more amazing—and profitable—developments in the years to come. So take a long look at lithium, particularly if you have a production interest in organic chemicals, ceramics, air conditioning, greases, metallurgy, pharmaceuticals, brazing fluxes or atomic energy. Investigate this wonder metal. It could mean profits *for you!*

. . . trends ahead in industrial applications for Lithium

LCA **LITHIUM CORPORATION OF AMERICA, INC.**
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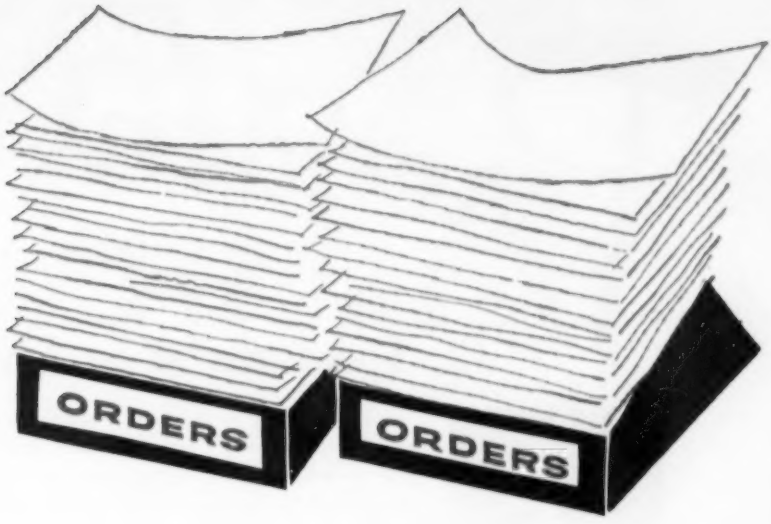
MINNEAPOLIS 2, MINN.

MINES: Keystone, Custer, Hill City, South Dakota • Bessemer City, North Carolina • Cat Lake, Manitoba • Amos Area, Quebec • BRANCH SALES OFFICES: New York • Chicago
CHEMICAL PLANTS: St. Louis Park, Minnesota • Bessemer City, North Carolina • RESEARCH LABORATORY: St. Louis Park, Minnesota

no one

KNOWINGLY

would trade these...



for a few of these!

So...protect your products' reputation by specifying **EMERY FATTY ACIDS!**

It's possible to buy fatty acids at a lower price—but only at the expense of high quality. Aside from resulting in lower grease yields and erratic processing performance, your use of low-price fatty acids will make your greases inherently lower in quality, less resistant to oxidation. This in turn will jeopardize the time and dollars spent in building your company's reputation, and most important, discourages repeat orders. No one knowingly would be so penny-wise and profit foolish.

The very high quality of Emery 531 Animal Fatty Acid enables you to produce the finest quality greases time after time. And their consistent top-quality performance will be your maximum assurance of satisfied customers . . . your assurance of repeat orders.

In addition, reliable continuity of supply, convenient sales offices and warehouses, a complete selection of fatty acids, and ready technical service, make Emery your one best source for all fatty acids.

Emery

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio

New York • Philadelphia • Lowell, Mass. • Chicago • San Francisco
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President's page

by H. L. HEMMINGWAY, President, N L G I

The Spokesman as an Advertising Medium

The advertising manager of a large company, in commenting on an advertising proposal for a trade association yearbook, recently wrote "We consider such an advertisement in the nature of a gratuity, and to dignify it as an advertisement for business purposes is an abuse of good advertising administration."

Unfortunately, many advertising managers may take the same view on all trade association publications, including the *NLGI Spokesman*. It is our sincere belief that a company that designs its Spokesman advertising with the idea that it is merely a gratuity, will miss most of the benefits that a sincere message to *Spokesman* readers could accomplish.

Widsepread Readership

Although 3000 people receive the *Spokesman* each month, it can be assumed that through multiple readership many more see the publication. The *Spokesman* goes to 41 states and the District of Columbia, and more than 10% of its circulation goes to 32 foreign countries.*

What kind of an audience does the *Spokesman* advertiser reach? It is certain that among lubricating grease manufacturers the readership includes those who profoundly influence the purchase of: packages, dispensing equipment, lubricating grease and oil additives, testing equipment, fats and metal compounds, other types of gelling agents, extreme pressure ingredients, lubrication charts, packaging equipment, lubricating oil and grease blending or manufacturing equipment, processing chemicals, soluble and cutting oil additives and ingredients, instruments and controls and all of the many other items used by lubricant manufacturers. Since a substantial portion of the readership is composed of consumers or resellers of lubricating greases, advertising in the *Spokesman* hits a concentrated group of people who are influential in the purchase of lubricating greases of all types.

Its Readership Is Concentrated Buying Influence

Considering the concentration of buying influence in its readership, an advertisement in the *Spokesman* is also a tremendous bargain. For example, to prepare and send a simple, mimeographed two cent (four cents outside the U. S.) post card to the *Spokesman* mailing list would probably cost about 3½ cents per card. *The total cost would be nearly twice as much as a one time insertion of an ad the same size in the Spokesman*, and probably it would not have the added benefit of multiple readership. Since the *Spokesman* rate is reduced for multiple insertions, sending one mimeographed two cent post card per month for a year to the *Spokesman* subscriber list would cost nearly three times as much as the same amount of space each month in the *Spokesman!*

A Sound Business Investment

These are some of the reasons why there are now nearly 50 companies that advertise consistently in the *Spokesman*, as compared with 9 companies fifteen years ago. Two companies have advertised regularly and continuously in the *Spokesman* for more than fifteen years.

Circulation of the *Spokesman* grows each year. It reaches a concentrated group who influence the buying of many products. Space costs from one-half to one-third as much as the cost of preparing and mailing a two-cent post card. An advertisement in the *Spokesman* is not a contribution. It is a sound business investment.

*Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Cuba, Denmark, Egypt, England, France, Germany, Holland, India, Indonesia, Ireland, Italy, Japan, Yugoslavia, Mexico, New Zealand, Peru, Portugal, Puerto Rico, Scotland, Venezuela, South Africa, Spain, Switzerland and Sweden.

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NLGI Spokesman

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ABOUT THE COVER

Among other well done services to NLGI, Mr. H. A. Mayor, Jr., is also Chairman of the *Spokesman* Advisory Committee. When he was in the Institute office recently he helped us explain how to illustrate this cover to artist, Ronald Jones. He proved a real help and a born diplomat.

First we handed our artist copies of the three papers and some illustrations. He thumbed idly through the accumulation. "Fine Hole something or other . . . Mechanical Stability Tests . . . Shell Roll . . ." he muttered. "How do you illustrate this stuff?"

We explain that an illustration of a laboratory building and maybe a penetrometer might do the trick. He looked suspiciously at us, "what's a pene . . . something or other?"

Mr. Mayor stepped into the confusion. "Why not put in an illustration of a grease gun being used in a service station," he suggested. Artist Jones brightened up. "Sure, something a normal human being sees," he was almost enthusiastic. Mr. Mayor's practical suggestion put us on the beam. Here is the result.

W. M. MURRAY

NLGI ANNUAL MEETING

. . . Aimed at Farm Market
. . . Are We Keeping Up With IT?

W. M. Murray and Committee Design Program . . . Meets Test of Popular Demand

. . . More than 12 million automotive units on American farms.

. . . U. S. Farmers buy 12 BILLION GALLONS of petroleum products every year . . . MORE THAN ANY OTHER SINGLE INDUSTRY.

. . . Because of increased mechanization in the past 15 years farm output per man-hour has increased 83 per cent against only 30 per cent per men-hour in industry.

. . . In 1940 each U. S. farmer produced enough for himself and 10 others.

. . . In 1955 he is producing enough for himself and 17 others.

The Program Is Ready for You—Are You Ready for IT?

YOUR ROOM RESERVATION IS IT IN?

Many have had to make room reservations outside the Edgewater in past years because of space limitations. Don't let this happen to you. Attend a top-notch program this year in comfort.

DON'T WAIT UNTIL ROOMS ARE ALL GONE

1955 Program Aimed at Farm Market

The greatest advance in U. S. efficiency has taken place on the farm. You will hear about what lubrication has had to do with it at the NLGI Annual Meeting. Have we kept pace with this advance lubrication-wise? You'll find out at the meeting.

Appropriately, W. M. Murray, NLGI Vice President and Chairman of the 1955 Program Committee, has smartly chosen this as the theme for the first day of the

three day session. Months ago he foresaw that lubrication and the farm market would command public attention. Right now the subject of U. S. farms commands about as much public attention as the "summit talks" at Geneva.

Farmers Lubricate What, When and Where

Just released is a study of petroleum and automotive markets based on a study of 1,000 Kansas farmers, a hefty farm state. The study was made jointly by the API Marketing Research Committee and Capper Publications.

They came up with the conclusion that 65 per cent of farmers surveyed had their car lubricated at a service station; trucks and tractors were a different story. An amazing 42.3 per cent of them lubricated their own trucks at home and a whopping 98.2 per cent did the same thing with their tractors.

Furthermore, the survey shows the farmer completely lubrication conscious. Almost half surveyed lubricate their car every 1,000 miles and 52 per cent lubricate their trucks at the same interval. The slogan:

LUBRICATE FOR SAFETY EVERY 1,000 MILES

. . . means something to the farmer and he personally follows it up at both service station and home.

Farm Lubrication and NLGI Meeting

Ably visualizing this largest of all markets for our industry, W. M. "Bill" Murray and his Program Committee have devised a program to suit every taste from the lubricating grease technician to the marketing divisions and salesman in the field.

The first day of the session on October 31st will be completely devoted to lubrication and the farm market. In the morning you will hear a top market analyst from our largest publishing company describe "THE FARM MARKET."

The afternoon session will see 5 experts in a panel discussion tell you about "LUBRICATING GREASES FOR MODERN FARM MACHINERY." Here you will get it straight from men who deal with this subject every day. It's practical and covers about every phase of farm lubrication and the part you play in it.

About Lubricating Grease

Tying in and closely associated with the use and application of grease will be a symposium plus 4 papers on Tuesday, November first. "FLOW PROPERTIES OF LUBRICATING GREASES" is the subject of the symposium. Here again a group of authoritative scientists will discuss and debate the topic as scheduled.

In the afternoon four important individual papers will be given. The titles for these papers, which indicate considerable audience interest, include:

Comparison of Grease Bleeding Tests with Field Storage.

Anti-Oxidants for Greases.

High Temperature Ultra High Speed Grease Lubrication.

Picker Lube Pay Off.

Technical Committee Session

On Wednesday, November second, the usual Technical Committee Session will be held in the morning. Presiding will be able Chairman of the Committee, T. C. "Ted" Roehner. Now tentatively scheduled are reports of sub-committees and new business.

We wish it were possible to tell you all about every subject and speaker you will hear at NLGI's 23rd Annual Meeting. Space just doesn't permit it. More about the program and speakers in a later edition of the SPOKESMAN.

SEE YOU AT THE ANNUAL MEETING ! ! !

NLGI ANNUAL MEETING

—Make Your Room Reservation—

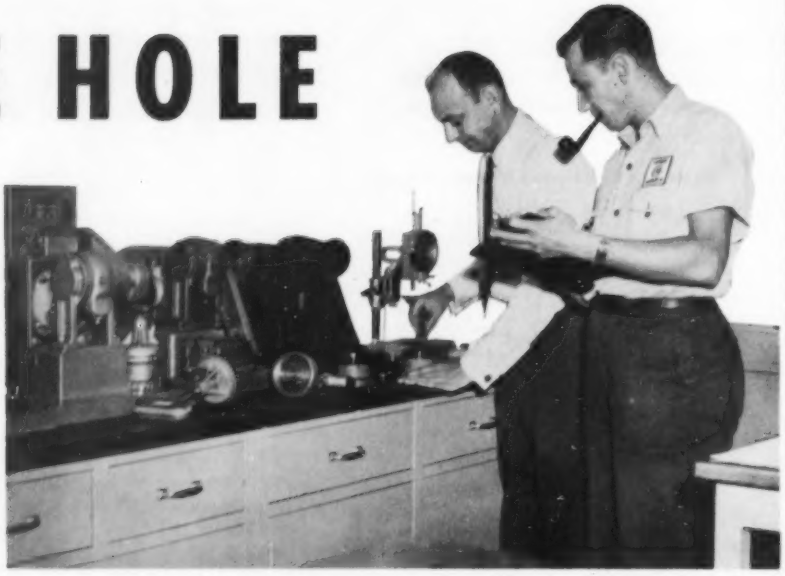
SEND IT TO:

Reservation Department, Edgewater Beach Hotel

5300 Block—Sheridan Road, Chicago, Illinois

Meeting Dates Are . . . Oct. 31 and Nov. 1, 2, 1955

THE FINE HOLE LUBRICATING GREASE WORKER AS A RAPID SHEAR STABILITY TEST



Some of the work that went into preparation of this article. Here is Author Sigler preparing a grease sample for penetration test. Co-Author Meinssen recording data.

By PHILIP R. SIGLER and KLAUS MEINSSEN
Cities Service Oil Company

This paper was presented as a part of an ASTM Symposium, Technical Committee G, during a meeting held in Houston, Texas, February 16, 1955. Presented in three sections, this and the two following papers were part of the first section devoted to the subject "Evaluation of Laboratory Equipment".

The lubricating grease industry needs a rapid shear stability test to supplement present time consuming test procedures. This need led to an investigation of the relationship between the worker used in ASTM Method D217-52T and the fine hole worker specified in Federal Specifications VV-L-79le under Method 313.1. The only difference between the two workers is the number and size of holes in the perforated plate; the ASTM worker has fifty-one ¼-inch holes and the Federal Specification worker has two hundred and seventy 1/16-inch holes. It was thought that the higher shear rate of the fine hole worker might make possible a reduction in the number of strokes required and, consequently, a much shorter test time. This could be of particular value for plant uniformity control tests on known greases and also of potential value for specification purposes.

A part of this work was to determine, if possible, the number of strokes in the fine hole worker which corresponds to ten thousand strokes in the ASTM worker, as reflected by the resulting penetration tests. An approximation of the respective rates of shear for the two workers was obtained by a calculation using the formula found in the Test for Apparent Viscosity of Greases, ASTM Method D1092-51, as follows:

$$\text{Shear Rate} = \frac{4\frac{v}{t}}{\pi R^3}$$

where:

$\frac{v}{t}$ = flow rate in milliliters per second through each hole in the perforated plate.

R = radius of the holes.

As stated, this is an approximation since the calculations are based on several assumptions such as:

1. No passage of grease takes place between the cup wall and the perimeter of the plate.
2. All of the lubricating grease is forced through the holes in the plate.
3. The velocity of the plunger is constant, representing an average velocity.

Employing these assumptions, the resulting rates of shear are in an approximate ratio of 10 to 1. This leads one to believe that 1,000 strokes in the fine hole worker

might be equivalent to 10,000 strokes in the ASTM worker. Work was then started to collect data on various lubricating greases to ascertain whether this hypothesis could be substantiated by empirical data.

Equipment and Test Procedure Used

The primary equipment used for this work consisted of the regular ASTM worker and the fine hole worker, the latter conforming to the Federal Specifications as previously mentioned. All other equipment used was in accordance with applicable ASTM methods.

The procedure used on all samples was as outlined in paragraph A-4 of the appendix to Method D217-52T. In all cases both the fine hole worker test and the regular ASTM worker test for each sample were performed on the same day in order to minimize any possible differences due to aging of the grease or variations in ambient temperature. Tests for each sample were run by the same operator, and the same penetrometer was used to reduce variations as much as possible.

Test Results

The penetration results for the two extremes encountered in this study are plotted in Figure 1. For Grease A, ten times the number of strokes on the ASTM worker changed the grease so that the resulting penetration test results were essentially equal to those obtained after using the fine hole worker. This comparison holds over a wide working range. However, for Grease B a considerable difference in resultant penetration values was obtained when following an identical procedure and making the same comparisons.

No special effort was made to determine if the results obtained for the lubricating greases used in this study had any relationship to actual quality; however, it is known that lubricating Grease A tends to soften in bearings while lubricating Grease B has an outstanding service record showing resistance to permanent softening. Both greases are established commercial products in successful use for a period of years.

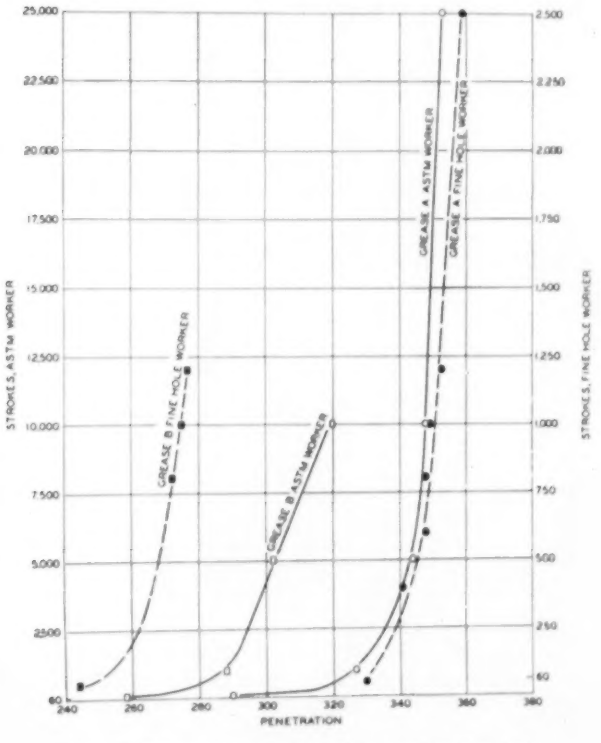


Figure 1. Extremes encountered in penetration tests.

Tables I and II present penetration results obtained on two types of sodium base greases of fibrous and of smooth buttery textures, respectively. Figures 2, 3 and 4 present this data in graphic form. Of the three fibrous greases presented in Table I and Figure 2 it will be noted that practically identical results are obtained for greases A and J at 1,000 strokes in the fine hole worker and 10,000 strokes in the ASTM worker. The exception is lubricating Grease E. Similar results were obtained for smooth, buttery-type, soda base greases. This is illustrated by Table II and Figures 3 and 4. It will be noted, however, that at 60 strokes the penetration number is consistently higher for the fine hole worker sample for both types of soda base lubricating greases. On the basis of the data presented thus far it would appear that the initial softening in the fine hole worker is greater than in the ASTM worker. This is as expected because of the higher rate of shear in the fine hole worker. It may be of interest that, of the seven soda base lubricating greases listed in Tables I and II, all have fairly good service records with the exception of Grease E.

TABLE I

Penetration Tests on Fibrous Type Soda Base Greases

Strokes	*Grease A*	*Grease E*	*Grease J*
ASTM Worker			
60	290	308	272
1,000	327	344	291
5,000	344	356	312
10,000	348	368	317
25,000	353	369	330
Fine Hole Worker			
60	330	337	295
400	341	362	301
600	346	366	306
800	348	369	311
1,000	349	376	318
1,200	353	377	322
2,500	359	386	337

The results obtained in all cases were not as consistent as those which have just been presented. Table III shows penetration data obtained on four additional soda base lubricating greases tested to determine if the same pattern applies to all greases of this type. These penetration data indicate that there can be considerable difference in results between 1,000 strokes in the fine hole worker and 10,000 strokes in the ASTM worker. Grease B shows the largest differences. Since the service record of this grease in ball and roller bearings has been excellent and because there was such a wide difference between the two workers, another operator checked these results. The second operator duplicated these results within three penetration points, well within test limits.

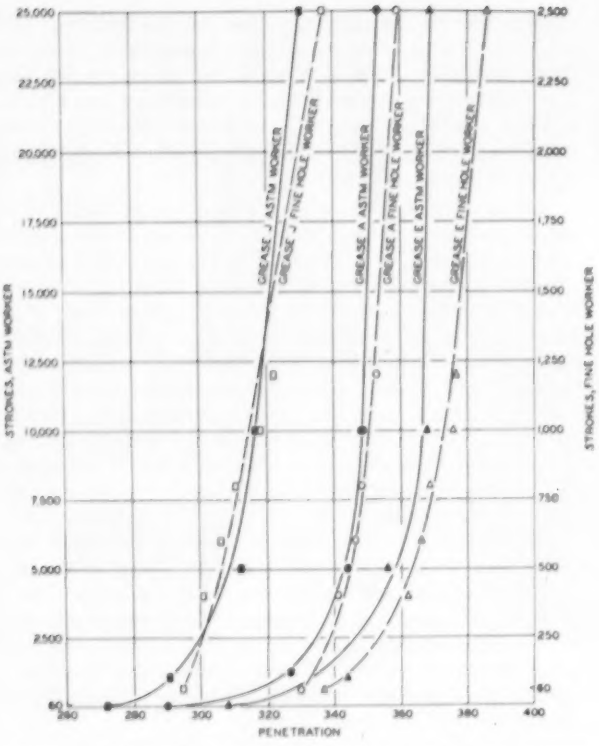


Figure 2. Penetration tests on fibrous type soda base greases.

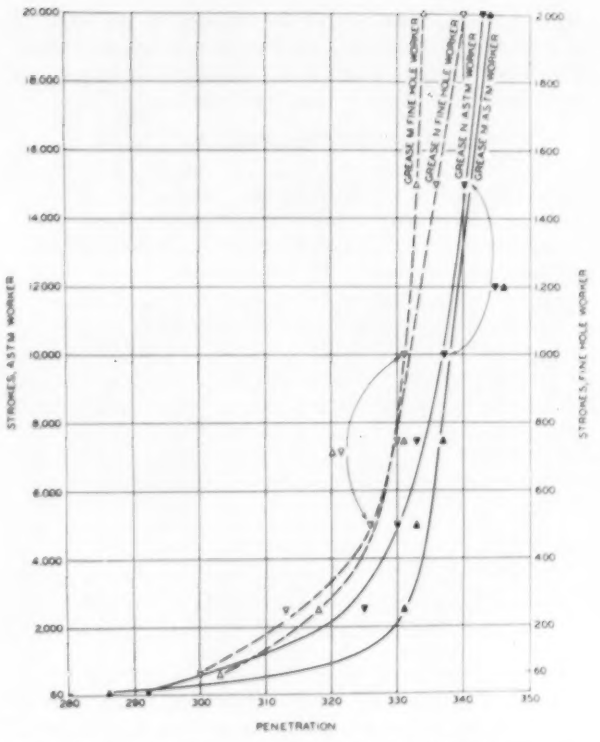


Figure 4. Penetration tests on buttery type soda base greases.

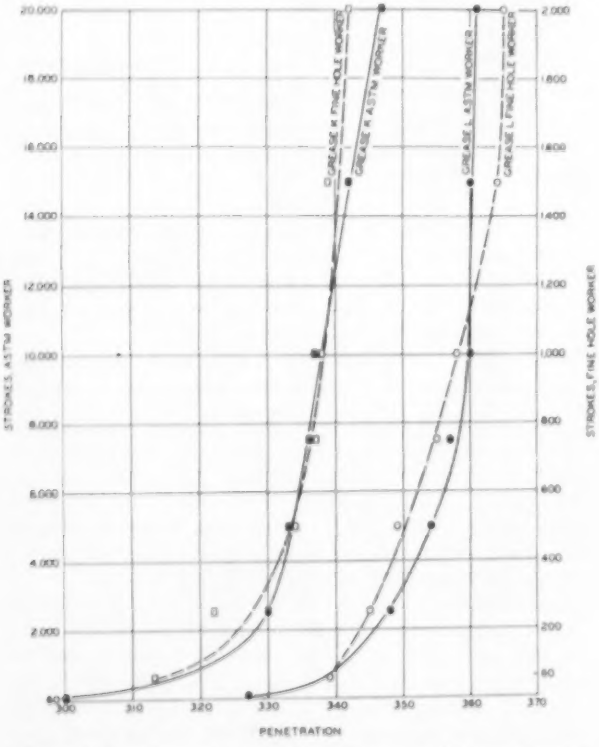


Figure 3. Penetration tests on buttery type soda base greases.

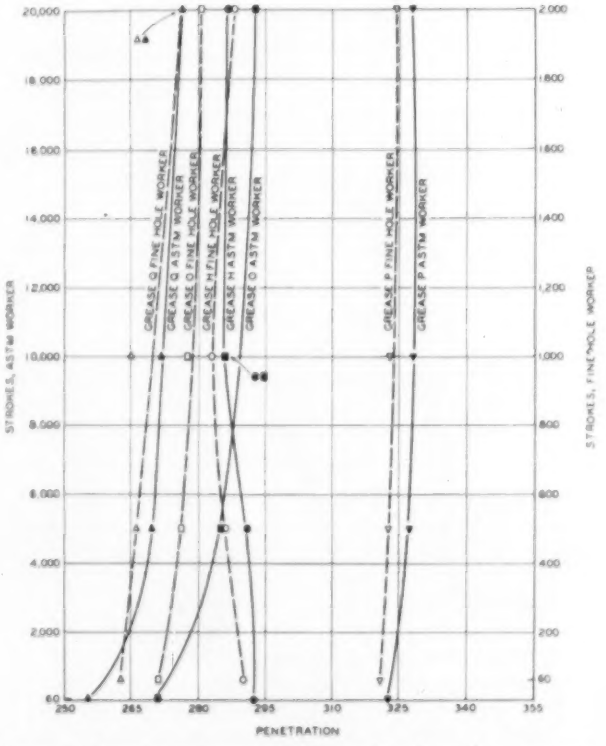

STROKES, ASTM WORKER
STROKES, FINE HOLE WORKER
PENETRATION
GREASE Q FINE HOLE WORKER
GREASE Q ASTM WORKER
GREASE O FINE HOLE WORKER
GREASE H FINE HOLE WORKER
GREASE H ASTM WORKER
GREASE O ASTM WORKER
GREASE P FINE HOLE WORKER
GREASE P ASTM WORKER

Figure 5. Penetration tests on lithium and calcium base greases.

TABLE II

Penetration Tests on Buttery Type Soda Base Greases

Strokes	*Grease L*	*Grease M*	*Grease N*	*Grease K*
ASTM Worker				
60	327	286	292	300
2,500	348	331	325	330
5,000	354	333	330	333
7,500	357	337	333	336
10,000	360	337	337	337
15,000	360	340	340	342
20,000	361	344	343	347
Fine Hole Worker				
60	338	303	300	313
250	345	318	313	322
500	349	326	326	334
750	355	331	330	337
1,000	358	331	331	338
1,500	364	333	336	339
2,000	365	334	340	342

TABLE III

Penetration Tests on Assorted Soda Base Greases

Strokes	*Grease B*	*Grease C*	*Grease D*	*Grease G*
ASTM Worker				
60	258	191	227	310
10,000	322	198	244	363
Fine Hole Worker				
60	244	190	230	318
800	272	...	...	...
1,000	274	186	241	344
1,200	276	...	...	...

TABLE IV

Penetration Tests on Lithium and Calcium Base Greases

	Lithium Base		*Calcium Base*	
Strokes	*Grease H*	*Grease O*	*Grease P*	*Grease Q*
ASTM Worker				
60	293	270	323	255
5,000	291	285	327	271
10,000	285	286	328	273
20,000	287	293	328	275
Fine Hole Worker				
60	290	271	321	263
500	285	275	323	266
1,000	283	278	323	265
2,000	288	281	324	275

From these data it becomes apparent that with lubricating Greases B, C and G the fine hole worker does not give results identical with those outlined with the ASTM worker. However, Grease D follows the same trend as the other soda base greases already presented.

In order to ascertain whether lubricating grease made with other soap bases follow the same pattern as those of sodium soap base, calcium and lithium soap base greases were also tested. Tests using two each of these lubricating greases are shown in Table IV and in Figure 5. At 1,000 and 10,000 strokes in the appropriate worker, Greases H and P gave approximately identical results while O and Q each differ by eight penetration points. It is interesting to note that Grease H hardened initially in both workers and softened only when the tests were executed beyond 1,000 and 10,000 strokes, respectively.

No attempt will be made to explain the differences found to exist between 1,000 strokes in the fine hole worker and 10,000 strokes in the ASTM worker when working some lubricating greases. However, one interesting observation made during this work was that a considerable difference in temperature rise of a grease can occur during working in the two different workers. This might be expected as the grease is more intensely worked in the fine hole worker. In order to demonstrate this, eight lubricating greases were run in each type of grease worker and the temperature rises recorded after 1,000 strokes in the ASTM worker (see Table V). In each case a greater rise occurred in the fine hole worker regardless of the fact that the number of strokes was only one-tenth that used in the ASTM worker. In general the harder penetration grades of lubricating greases developed temperature differences between the two workers greater than those for similar, but softer, penetration grades of grease. The type of soap used in the lubricating grease has a considerable effect on this property. However, it can generally be said that the difference in temperature rise is not reflected in the change in penetration of these greases after working.

TABLE V

Temperature Rise During Working

Lubricating Grease	*NLGI Grade*	*Soap Type*	*Temperature after 1,000 strokes in Fine hole worker, °F.*	*Temperature after 10,000 strokes in ASTM worker, °F.*
A	2	Sodium	112	97
B	2	Sodium	106	90
C*	4	Sodium	122	97
D*	3	Sodium	104	89
E	1	Sodium	95	83
G*	0	Sodium	90	86
H	2	Lithium	103	91
I	2	Calcium	95	90

*Note: Identical soap base, but total soap content varies with penetration grade.

Conclusions

1. One thousand strokes in the fine hole worker produces approximately identical penetrations on many lubricating greases when compared to ten thousand strokes in the ASTM worker and could be used as a direct substitute in these cases.

2. The correlation between the results from both workers could be established on any given grease and the fine hole worker then used as a rapid control test.

MECHANICAL STABILITY TESTS FOR LUBRICATING GREASES

By E. F. KOENIG and E. M. JOHNSON

The Texas Company

Following is a reproduction of a paper presented during the ASTM Symposium, Technical Committee G. It is part of the first section entitled "Evaluation of Laboratory Equipment".

SYNOPSIS

Since ordinary physical and chemical tests do not predict the field performance of a grease and since field operating conditions vary widely, no one piece of equipment is suitable for evaluating the mechanical stability of greases for all applications. Therefore, functional mechanical testers are required for this purpose. Among the equipment at Beacon Laboratories of The Texas Company, and useful in this respect, are the SKF and Torque Breakdown Machines, the Vibrating Wheel Bearing Tester and the electron microscope. The first two are valuable in differentiating between greases, for predicting their field performance, and for evaluating the compatible mechanical stability of mixtures of greases. The third tester is still under development, but shows some promise of correlation with field performance of wheel bearing lubricants. The electron microscope has proven advantageous in studies of mechanical stability. However, caution must be used in the interpretation of its photomicrographs lest misleading results be obtained. Data are included in the paper for the substantiation of the above statements.

The increasing demands placed upon grease lubrication in recent years by virtue of huge increases in operating temperatures, pressures, speeds and new environments have simultaneously increased the need for functional mechanical tests which can be performed in the laboratory and which correlate with service in full scale equipment. One of the more interesting characteristics of greases for investigation in laboratory equipment is mechanical stability, which is defined here as a change in consistency and/or structure occasioned by the mechanical working of a grease. This is a very engaging subject and one upon which considerable effort has been expended. The number of variables influencing mechanical stability are tremendous. It is known, for example, that this characteristic of greases is influenced by the quantity and type of soap, the fatty base and the type oil used in the product, as well as the method of manufacture. It has also been postulated that the length/diameter ratio of the grease fibres determines the consistency of a grease. However, the length/diameter ratio is not necessarily a good indication of shear stability, since other factors such as fibre twist, fibre strength and initial fibre length also contribute to the extent of breakdown which may occur with working. To further complicate the problem, certain lubricants may show a change in fibre structure with storage. When all these factors are considered in combination with the wide range of operating conditions under which a grease may be used, it becomes readily apparent that something more than the normal physical and chemical tests is required to evaluate mechanical stability.

The ultimate rating of a grease depends, of course, upon its performance in service in the equipment and under the conditions for which it was intended. However, it is frequently impractical to use field operating equipment except as a final proof test in the development of a grease; therefore, mechanical laboratory tests are resorted to as screening agents. It is generally recognized that such laboratory tests have certain limitations, the most important usually being correlation with actual service operation. In contrast, laboratory tests permit closer control of the variables, are usually less expensive than full scale tests, can be accelerated to provide data within a reasonable time, and may eliminate hazards to operating personnel. For these reasons, functional and realistic mechanical testers form a vital segment of every grease manufacturer's laboratory equipment.

To satisfy the increasing demand for testers which will simulate some condition of field operation, an endless number of designs have been originated, some to fit a specific need in a new field of grease application and others to improve on existing tests. Many of the older and simpler tests have not proven as successful as originally anticipated. For instance, the mechanical grease worker, while subjecting greases to shear, is not reliable in predicting field performance. To attempt to discuss a majority of the existing grease evaluation machines is beyond the scope of this paper and only a few have been selected on the basis of their current interest in the field of mechanical stability.

1. Supervisor and Assistant Supervisor, respectively, Products Application Department, Beacon Laboratories, The Texas Company, Beacon, New York.

The testers chosen for discussion are the SKF Machine, The Texas Company's Torque Breakdown Machine and Vibrating Wheel Bearing Tester, and the electron microscope. The first three were selected on the basis of their ability to operate at moderate temperatures where the oxidation and thermal stability of the greases being evaluated do not tend to excessively mask mechanical stability. Since these three testers have been previously described to the ASTM,[2] it should not be necessary to include a detailed discussion of them here. Instead, comments will be devoted to application of these apparatus. Briefly, the SKF Machine is a heavily loaded type bearing tester for evaluating ball and roller bearing lubricants; the Torque Breakdown Machine is an unloaded device for observing the texture, adhesiveness and leakage characteristics of a grease or mixtures of greases; and the Vibrating Wheel Bearing Tester is an unloaded (except for vibrational loads) unit employed in rating the leakage tendencies of wheel bearing lubricants. While the electron microscope does not fall in the same category as the other pieces of equipment, it is a research tool whose increasing utility and importance in the study of greases is being recognized. Because of this, a brief discussion is included to point out some of the pitfalls that may trap the unwary in the interpretation of electron photomicrographs as related to grease performance.

SKF Machine

In antifriction bearings, a number of factors, such as load, speed, temperature and operating time, can affect the mechanical stability of greases. The SKF Machine, Figure 1, is admirably suited to the evaluation of ball and roller bearing lubricants because of the control exercised ove rthese variables. Recent investigations with this apparatus have developed interesting data, portions of which will be discussed here.

2. M. Herbst, W. A. Prendergast, R. S. Barnett, W. J. Finn, O. P. Puryear, Laboratory Performance Tests for Antifriction Bearing Greases, ASTM Special Technical Publication No. 84, Symposium on Functional Tests for Ball Bearing Greases, 1948.

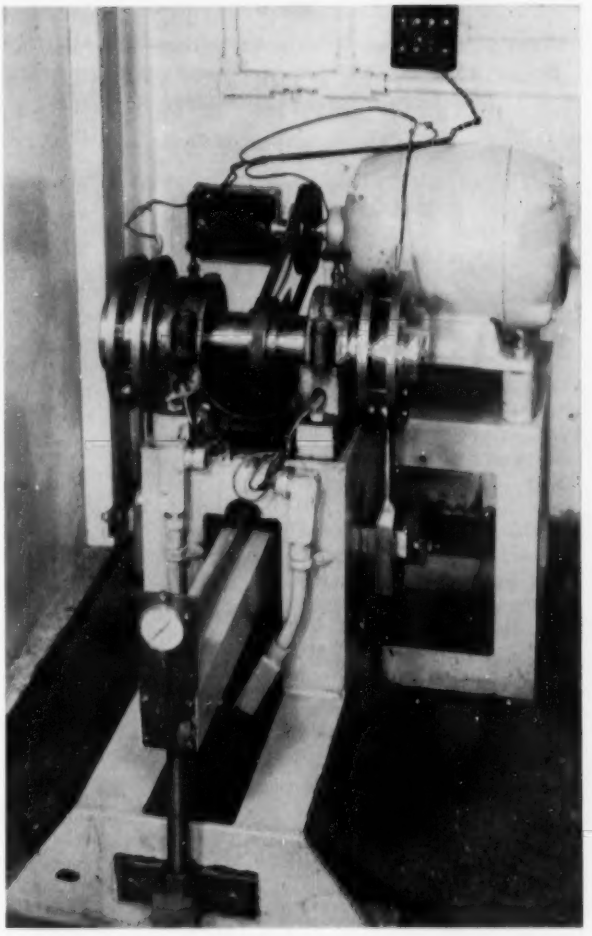


Figure 1. SKF Machine.

TABLE 1

SKF Machine—Effect of Speed on Grease Performance—50 Per Cent Grease Charge—150 Hours

Grease	*Grease Type*	*Soap Type*	*NLGI Grade*	*Av. Temp. Rise Above Ambient, °F., at 1000 RPM*	*Av. Temp. Rise Above Ambient, °F., at 3000 RPM*	*Comments*
		SKF NJ-312 Roller Bearings—4300-pound load				
A	Buttery, shear resistant	Li	2	24	64	
B	Buttery, shear susceptible	Na-Ca	2½	37	83	
C	Long fibred, spongy, fairly adhesive, shear resistant	Na	3	57	139	Ran only 2½ hours. Grease wound out of bearings causing excessive temperatures.
D	Short fibred, adhesive, moderately shear susceptible	Na	2	63	123	Ran 113 hours. Grease wound out of bearings causing excessive temperatures.
		Fafnir 312-K Ball Bearings—2500-pound load				
A		Li	2	18	26	
B		Na-Ca	2½	9	40	
C		Na	3	24	55	
D		Na	2	35	80	

TABLE II

Effect of Speed on Grease Retention—SKF NJ-312 Roller Bearings 4300-Pound Load—50 Per Cent Grease Charge—150 Hours

Grease	*Grease on Bearing at End of Test Per Cent by Weight at* 1000 *RPM*	3000 *RPM*
A	100	65
B	92	63
C	50	*
D	34	†

*Terminated at the end of 2½ hours. Grease wound out of bearings causing excessive temperatures.

†Terminated at the end of 113 hours. Grease wound out of bearings causing excessive temperatures.

Tables I and II present data on the effect of speed on the performance of a variety of greases in both ball and roller bearings under load. The data show that the fibrous type greases (C and D) produced the highest operating temperatures at both high and low speeds, and that they also produced the greatest increase in bearing temperature with an increase in speed from 1000 to 3000 RPM. In these tests, the roller bearing application was the most severe, as indicated by grease retention and temperature rise. This may be noted from Table I where the fibrous greases wound out of the bearings, reducing effective lubrication to a point where excessive operating temperatures and early test failure occurred. This is emphasized in Table II where the amount of grease remaining on the bearings upon completion of the test is shown. Note particularly that both fibrous greases migrated from the bearings at the highest speed, causing termination of the test prior to the usual 150 hours. Although this effect was most noticeable on roller bearings under this test, it also confirms previous statements by othe investigators[3] on ball bearings.

3. E. N. Klemgard, Lubricating Greases: Their Manufacture and Use, Reinhold Publishing Corporation, 1937, page 816.

Although the fibrous nature of Grease D undoubtedly contributed to the grease migration due to a roping effect, there was also a definite change in the consistency of the product. Relative to this, the grease reacted differently at the two speeds, showing a softening in the roller bearing at the lower speed (1000 RPM) of 59 points (miniature penetration) and a hardening beyond the range of the penetrometer at the high speed (3000 RPM). A similar effect was noted in the ball bearings with a softening of 101 points (miniature) at 1000 RPM and a hardening of 64 points (miniature) at 3000 RPM. On Grease C, the duration of the run was so short, no significant penetration data were obtainable because of the small amount of grease remaining on the bearings.

Because of the higher operating temperatures and grease migration, fibrous greases are not as satisfactory for high speed, high load, unshielded antifriction bearing applications as the smooth, buttery type greases. This does not imply that sodium soap fibrous greases are unsatisfactory for all applications, since they do perform extremely well in certain fields.

Table III presents data from an endurance type test performed on the SKF Machine that provides a satisfactory means of assigning a relative rating to antifriction bearing greases. While it is realized that the operating temperature and duration of this test are such that the results are also influenced by the thermal and oxidation stability properties of greases, it is felt that the results are still of interest to the subject at hand as an example of the versatility of the equipment. To evaluate products by this method, they are generally considered on the basis of the number of hours to failure up to a maximum of 500 hours. Where a grease completes the required test time, other factors are also taken into account, such as distribution in the bearing and housing, extent of oxidation and bleeding, soap separation, wear and appearance.

To illustrate the degree of differentiation that may be obtained with this test, data have been selected from six greases, representing a variety of soap bases and consistencies. Of these, Greases G and I may be considered referee products, since they are premium grade ball and roller bearing lubricants with many years of exceptional field performance.

TABLE III

SKF 500-Hour Endurance Test—SKF NJ-312 Roller Bearings 4300-Pound Load—2000 RPM—250° F.—75 Gram Grease Charge

Grease	*Grease Type*	*Soap Type*	*NLGI Grade*	*Hours Completed*	*Decrease in % Oil*	*% FFA (As Oleic)*	*Comments*
E	Slightly fibrous, shear resistant	Pb-Ca	2	19	—	—	Failed test; bearing dry; black dry deposits.
D	Short fibred, adhesive, moderately shear susceptible	Na	2	288	14.4	9.1	Failed test; overheating; dry deposit on bearing.
F	Smooth, buttery, shear susceptible	Na	1	308	—	—	Failed test; bearing frozen; hard, dry deposit.
G	Smooth, buttery, shear resistant	Na-Ca	2½	500	12.2	5.4	Passed test.
H	Smooth, buttery, shear resistant	Li	2	500	Approx. 58	—	Passed test.
I	Smooth, buttery, shear resistant	Na	0	500	—	—	Passed test.

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When compared to smooth, buttery products, the data once again demonstrate the relative inferiority of fibrous greases (D and E) under conditions of high load, medium speed and moderate temperature.

This test is also proficient in differentiating between greases of the smooth, buttery type, as disclosed by the results on Greases F, G and I. As previously noted, G and I are premium products and pass the test without difficulty. Grease F, however, while formulated for the same antifriction bearing application as Grease I, is considerably inferior. Here, the grease on the bearing was reduced to a hard, dry, black deposit which caused bearing seizure in 308 hours. To forestall comment that the consistency of F was responsible for the failure, it should be noted that both softer (I) and harder (G) products performed satisfactorily.

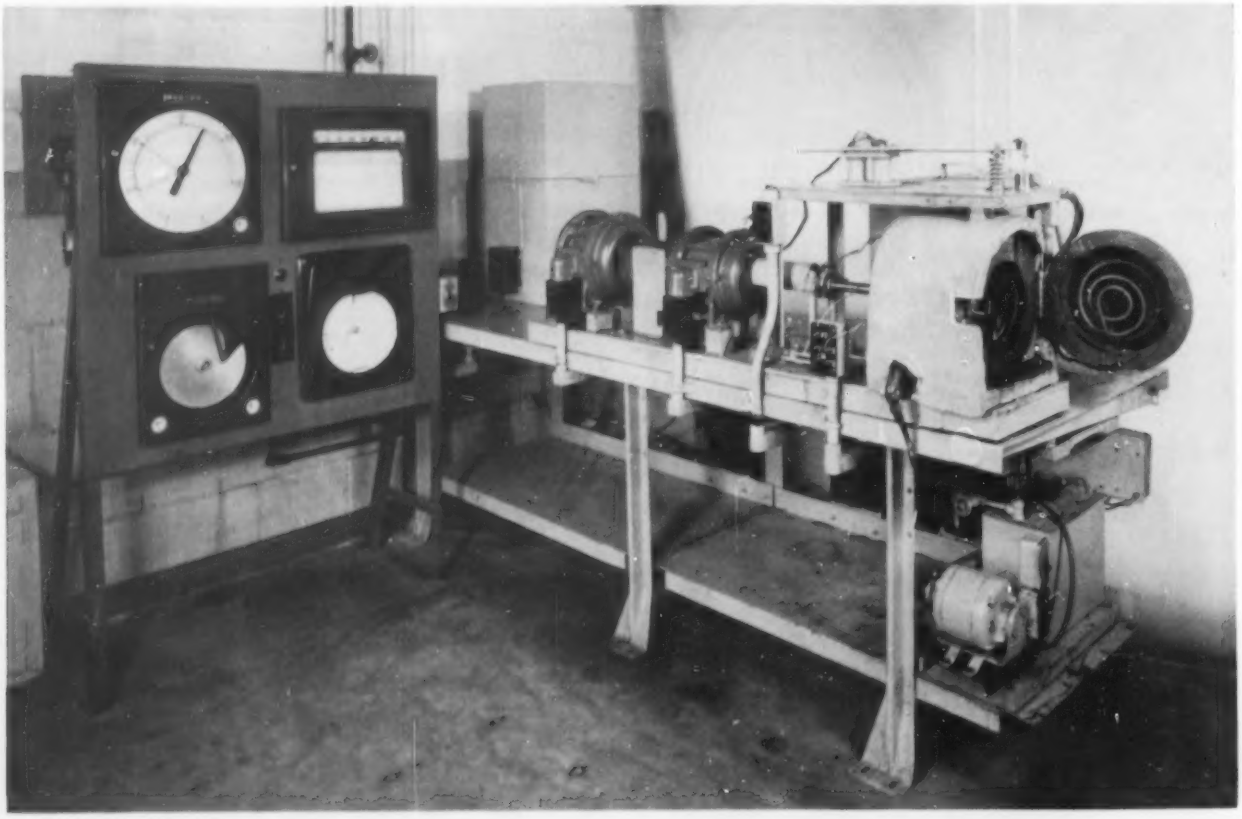
Grease H has been included here to demonstrate the fallacy of relying too heavily upon a single number for the mechanical evaluation of a grease. The 500-hour test was completed without mechanical failure or excessive temperature rise. On this basis, it might be concluded that it was equal to Grease G. However, such was not the case, since further observation showed it had lost over 50 per cent of its oil component, causing a hard, dry deposit of oxidized material to build up between the rollers. In addition, the grease in the housing was also hard, dry, and black. This was not surprising, since Grease H was formulated to meet the demand for a multipurpose product. In order to be proficient under a wide variety of operating conditions, certain compromises were required compared to other products, such as Greases G and I, which were designed to be outstanding in specific applications.

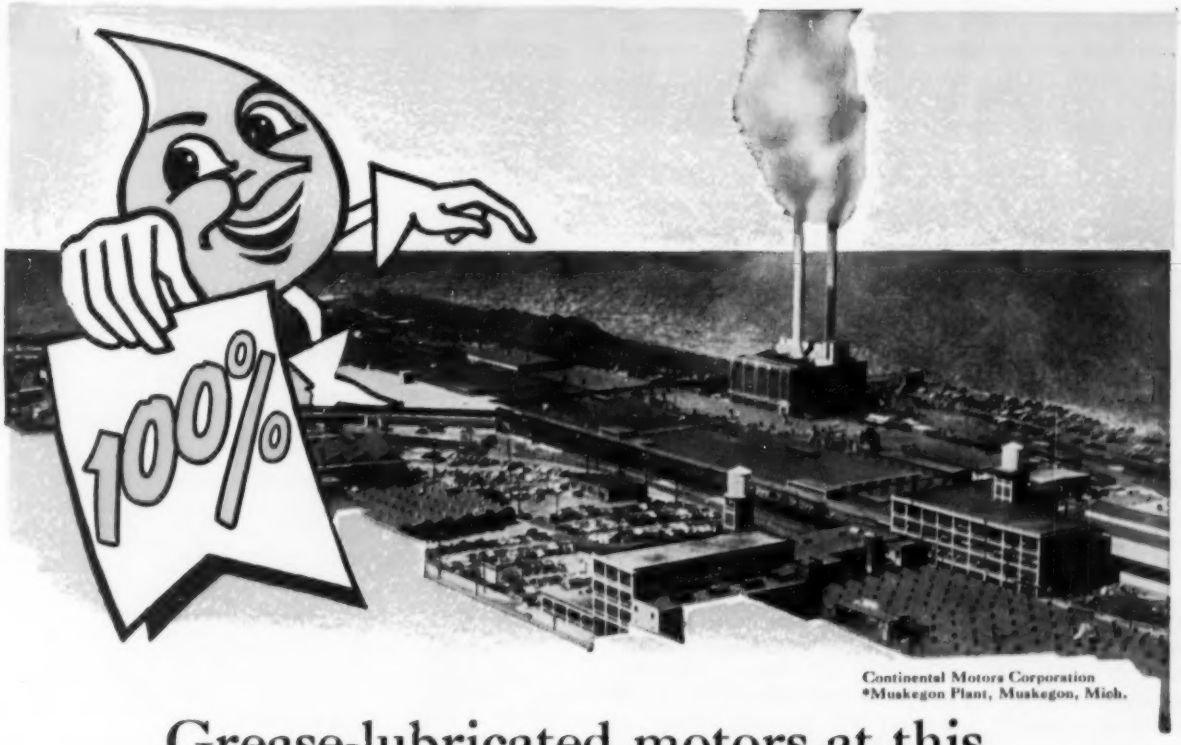
The foregoing data have been presented to illustrate the merit of the SKF Machine for differentiating between grease types, as well as between products of the same type, and to point out a means of using the machine for predicting the service performance of greases.

Torque Breakdown Machine

One tester which has been found to be extremely useful in predicting the mechanical stability of greases is The Texas Company's Torque Breakdown Machine, Figure 2. The most common test performed on this apparatus is of short duration (3 hours) and provides ratings based upon leakage, change in consistency, distribution, oil separation, condition of the bearing, operating temperatures and starting and running torques. Either ball bearings (No. 211) or Timken tapered roller bearings (No. 383 cup and No. 385 cone) may be used for evaluation work. The test starts at 80° F. and during the first hour is brought up to 250° F. where the temperature is held for two additional hours. A speed of 1750 RPM is used with ball bearings and 900 RPM with roller bearings. A grease charge of 32 grams in ball bearings and 50 grams in roller bearings is utilized. No load is applied during the test. For the purpose of this discussion, only data on penetrations (miniature), grease retention and leakage are included. Because of the small amount of grease remaining

Figure 2. Torque breakdown machine.





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on the bearings after a test, normal penetrations cannot be obtained, and miniature penetrations must be resorted to. Although there is no correlation between these and standard ASTM penetrations (D217-52T), they do permit a relative evaluation of the change in consistency of greases.

To demonstrate the range of results obtainable with this tester, Tables IV and V exhibit data from a variety of greases of different NLGI grades, soap base, fibre structure and manufacture evaluated with both tapered roller and ball bearings. In Table IV are shown roller bearing ratings on eight greases, covering three NLGI grades and four different soap types, arranged according to their rating within each grade. The data illustrate that a reasonable distinction can be obtained between products, both within a given NLGI grade and between NLGI grades. Ratings on the same greases using a ball bearing are included in Table V. The same general distinctions hold true here as in the case of the roller bearing, with the exceptions that Grease M rated slightly better and Grease N poorer when compared to their equivalent ratings in Table IV.

Ratings such as these are, of course, only relative and cannot be translated directly into terms of field performance. However, as in the previous discussion on the SKF tester, referee greases can be used and comparative interpretations made with other lubricants. Two such referee greases are J and P, which are also premium grade ball and roller bearing greases with excellent field performance records.

Perhaps the greatest value derived from this machine is its ability to predict the compatibility of greases. This knowledge is particularly desirable when a changeover in the field is to be made from one product to another, since it frequently determines whether a lubrication system must be completely cleaned or if a certain amount of contamination with the old product can be tolerated. To evaluate the compatible mechanical stability of two greases, a minimum of three runs are required, one of each of the products alone and one on a blend of the two in any proportion desired. For the two greases to be considered compatible, the blend must rate at least as good as the better of the two individual samples. Several possibilities exist when two greases are mixed. For example, two greases individually rating good may provide a poor or incompatible mixture, a good grease may pull a poor one up, or a poor grease may pull a good one down. Several instances of compatibility and incompatibility are presented in Table VI on 50 per cent mixtures of two greases. The data emphasize the fallacy of trying to predict the compatibility of two products on the basis of individual testing. As an illustration, Greases R and S, alone and as a mixture, showed satisfactory retention on the bearings, no unreasonable hardening or softening and no leakage. However, very undesirable deposits occurred with the mixture which were not present with either of the components alone. A further case is that of Greases T and U, where each alone rated good and showed no leakage. A mixture of the two showed a nearly complete breakdown with a leakage value so high and grease retention so poor that insufficient grease remained on the bearing to obtain a miniature penetration. The remaining data disclose instances where a high rating grease (V) has improved the rating of a poorer product (L) and where a poor grease (N and J) has depreciated a better product (W and M, respectively).

Information similar to the foregoing is of considerable value when used with physical and chemical tests and a knowledge of the field environment to predict the field performance of a grease, particularly with respect to its compatible mechanical stability when contaminated with another product.

Vibrating Wheel Bearing Tester

Although a number of wheel bearing testers are available for the laboratory evaluation of greases for this application, the majority have been found to be unsatisfactory from the standpoint of correlation with field performance. One which appears to have merit, though not yet perfected, is The Texas Company's Vibrating Wheel Bearing Tester, Figure 3. Since the last report to the ASTM[4] on this apparatus, its mechanical design has remained basically unchanged. However, operating conditions have been modified as necessary to provide a more useful tool. At present, two hubs from the rear wheels of a 1936 1-½ ton Ford truck are used as the test section. Standard Timken bearings in each hub assembly are packed with 250 grams of grease (75 grams in each bearing and 175 grams in each hub). The test is conducted at 200°F. for 18 hours. During this time, the bearings rotate at 280 RPM (equivalent to 37 MPH with a 6.5″ x 20″ tire) and vibrate through an amplitude of ⅜ inch at 975 cycles per minute. The main criterion of evaluation is

4. M. Herbst, W. A. Prendergast, R. S. Barnett, W. J. Finn, O. P. Puryear, Laboratory Performance Tests for Antifriction Bearing Greases, ASTM Special Technical Publication No. 84, Symposium on Functional Tests for Ball Bearing Greases, 1948.

TABLE IV

Torque Breakdown Machine—Timken Roller Bearing—80-250°F.—900 RPM

Grease	Grease Type	Soap Type	NLGI Grade	Miniature Penetration Before	Miniature Penetration After	Grease on Bearing, %	Leakage, %	Rating
J	Smooth, buttery	Na-Ca	2	79	181	71	0	Good
K	Smooth, buttery	Li	2	112	97	58	0	Good
L	Smooth, slightly fibrous	Na-Ca	2	47	365	25	31	Fair
M	Smooth, buttery	Na-Ca	2	110	53	27	49	Poor
N	Slightly fibrous	Ca-Pb	1	282	Too soft	56	22	Fair
O	Long fibred	Na	1	128	118	48	32	Fair
P	Smooth, buttery	Na-Ca	0	202	234	72	0	Good
Q	Slightly fibrous	Ca-Pb	0	Too soft		13	65	Poor

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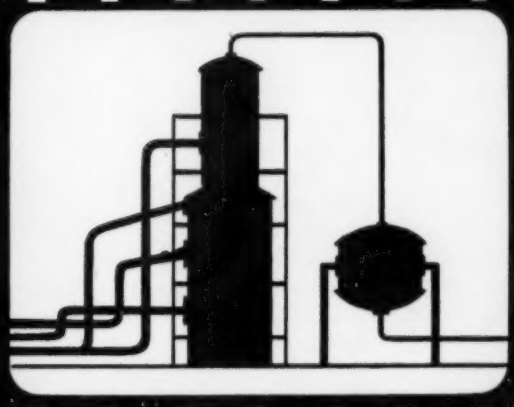

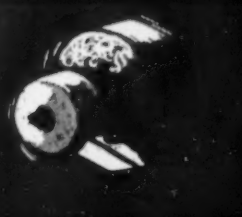

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grease leakage, although other items such as appearance, distribution, oil separation, color and condition of the bearings are considered.

Table VII demonstrates the ability of the test to discriminate between greases for wheel bearing applications. In the tabulation, Grease AA is a superior grade ball and roller bearing grease while Grease CC is a sodium base, short fibred product designed for wheel bearing service. Both of these gave satisfactorily low leakage. In contrast to these, Grease BB showed considerably higher leakage. These data also illustrate that the shear susceptibility of a grease does not always predict its actual performance. This is shown by Greases BB and CC, where CC underwent the greatest consistency change and yet was superior from a leakage standpoint.

A huge backlog of data has been obtained on this tester since its conception and the most recent investigation has revealed about a 70 per cent ability to predict poor field performance, based upon a comparison with the limited amount of valid service data available. While this is encouraging, additional work is underway to improve the correlation as well as to establish the limits of reproducibility.

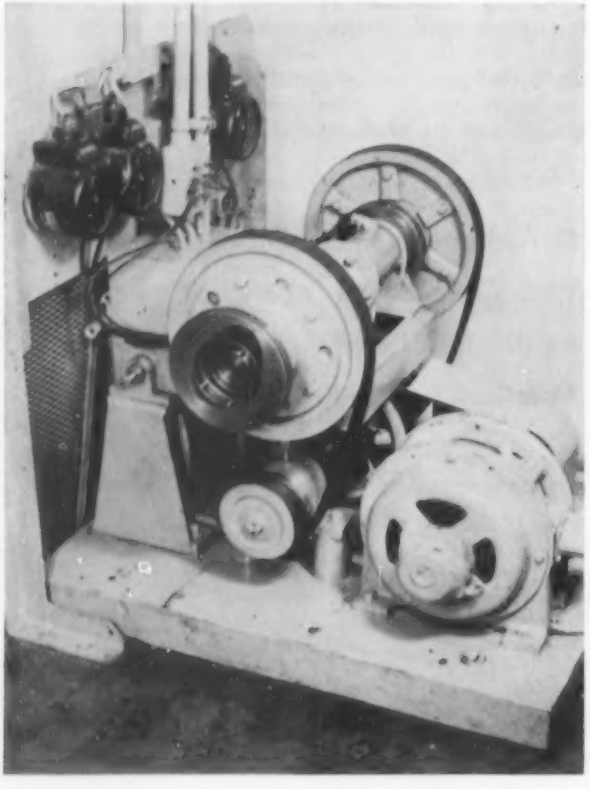
TABLE V

Torque Breakdown Machine—Ball Bearing—80-250°F.—1750 RPM

Grease	NLGI Grade	Miniature Penetration Before	Miniature Penetration After	Grease on Bearing, %	Leakage, %	Rating
J	2	79	162	45	1	Good
K	2	112	105	71	0	Good
L	2	47	365	25	31	Fair
M	2	110	45	22	21	Fair
N	1	282	*	16	47	Poor
O	1	128	110	34	32	Fair
P	0	202	234	72	0	Good
Q	0	Too soft		13	65	Poor

*Insufficient grease left on bearing.

Figure 3. Vibrating wheel bearing tester.



Electron Microscope

Although not a primary tool for establishing the mechanical stability of greases, the electron microscope provides a convenient means of observing the structural changes produced in grease fibres by the working of a grease in some other piece of mechanical equipment. As such, it becomes worthy of discussion under this subject in order to point out that considerable caution must be exercised in the interpretation of data obtained.

To illustrate the fallacy of using electron microscope data indiscriminately, a series of electron photomicrographs have been prepared in Figure 4. Plate A shows the structure of an unused sample of a Na-Ca base roller bearing grease. Plates B and D are samples of the same grease from two roller bearings from two different shafts which were running abnormally hot. These show a definite breakdown in the structure of the grease, with that in Plate B having progressed to a further extent than that in Plate D. If the investigation were halted at this point, it would be logical to conclude that the abnormal temperatures recorded were a direct result of a failure of the grease structure. However, Plates C and E are photomicrographs of two additional samples of the same grease from bearings on the opposite ends of the same shafts from which B and D were obtained. The latter bearings were also the same type as the former ones and being on the same shaft, had the same operating history. Examination of Plates C and E disclose that the fibre structures are very similar to those in Plates B and D, which might tend to confirm the original conclusion, except for one thing. In the latter two examples, the bearings were operating normally and showed no evidence of malfunctioning, either before or after the samples were taken. By continuing the investigation to the second set of samples, the initial analysis, which attributed the primary cause of bearing malfunctioning to breakdown of the grease structure, was destroyed and it was necessary to seek the true reason elsewhere. In this particular instance, the final analysis showed the cause of the difficulty to be due to factors not at all associated with the mechanical stability of the grease.

The foregoing examples have been used to emphasize that, while the electron microscope is a most useful tool, caution must be used in the interpretation of its photomicrographs. If this is not done, the results obtained can be quite misleading.

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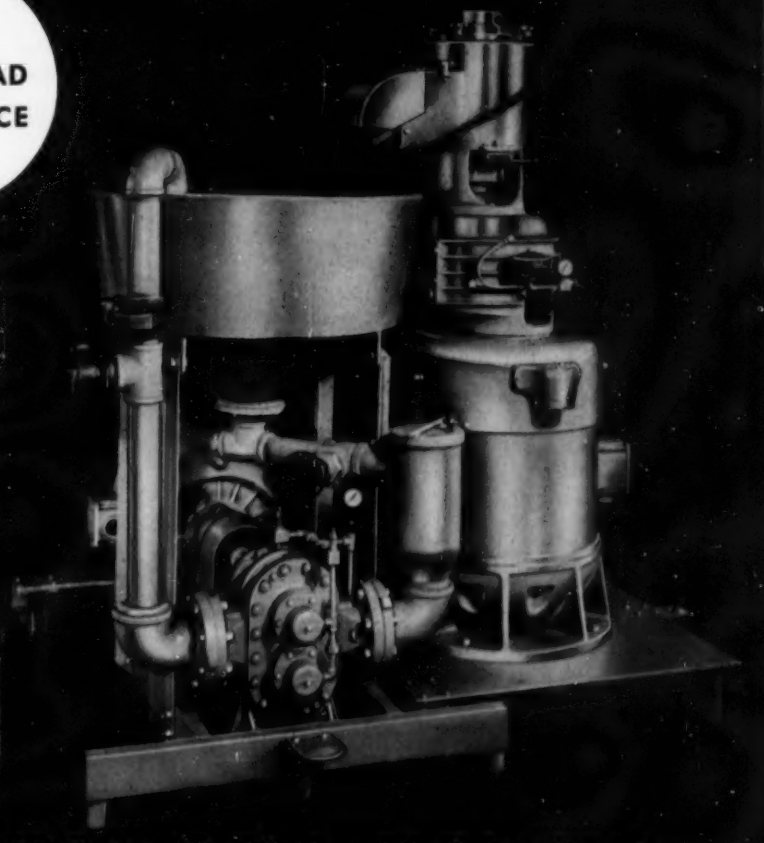

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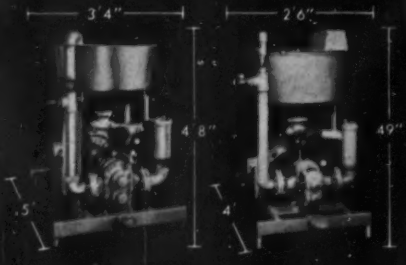

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TABLE VI

Torque Breakdown Machine—Compatibility

211 Ball Bearing

Grease	*Grease Type*	*Soap Type*	*NLGI Grade*	*Miniature Penetration Before*	*Miniature Penetration After*	*Grease on Bearing, %*	*Leakage, %*	*Rating*
R	Smooth, buttery	Li	2	80	39	33	0	Good
S	Smooth, buttery	Li	1	146	127	31	0	Good
50% R + 50% S		—	—	121	74	29	0	Poor*
T	Smooth, buttery	Na-Ca	2½	60	87	32	0	Good
U	Slightly soapy, stringy	Sr.	1	43	89	50	0	Good
50% T + 50% U		—	—	56	†	6	88	Poor
V	Smooth, buttery	Ca	2	91	149	31	0	Good
L	Smooth, slightly fibrous	Na-Ca	2	47	365	25	31	Fair
50% V + 50% L		—	—	107	190	53	16	Good
N	Slightly fibrous	Ca-Pb	1	282	†	16	47	Poor
W	Slightly stringy	Pb	1	261	‡	41	Trace	Good
50% N + 50% W		—	—	—	‡	28	41	Poor
	Tapered Roller Bearing							
J	Smooth, buttery	Na-Ca	2	79	181	71	0	Good
M	Smooth, buttery	Na-Ca	2	110	53	27	49	Poor
50% J + 50% M		—	—	96	49	29	48	Poor

*Grey, lacquer-like deposit on bearing race. Not readily removed with normal solvents.
†Insufficient grease left on bearing
‡Too soft

Figure 4. Electron microphotographs—new and used samples of Na-Ca base roller bearing grease.

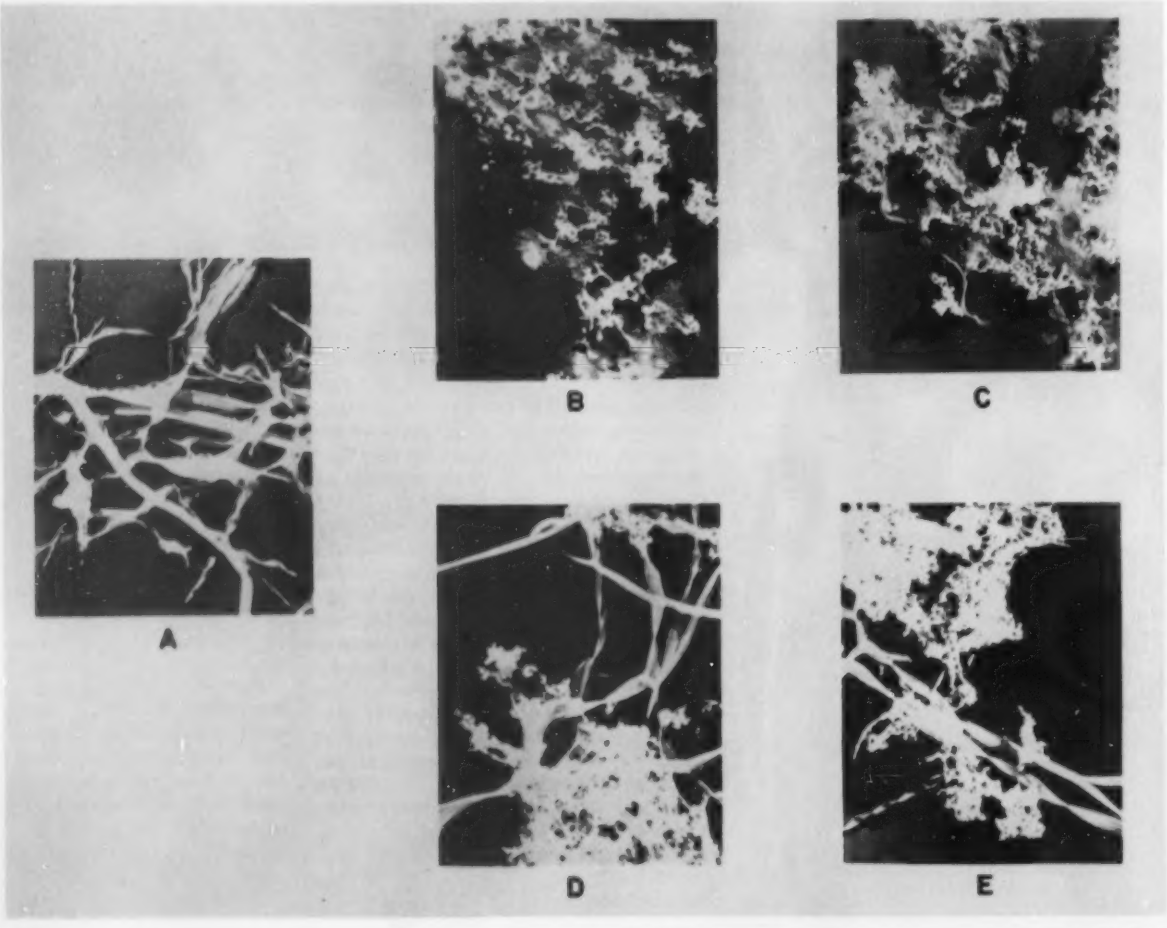


TABLE VII

Vibrating Wheel Bearing Test

Grease	*Grease Type*	*Soap Type*	*NLGI Grade*	*Leakage, Grams*	*Miniature Penetration Change**
AA	Smooth, buttery, shear resistant	Na-Ca	2½	8	0
BB	Smooth, lustrous, shear susceptible	Ca	2	169	+45
CC	Short fibred, adhesive, moderately shear susceptible	Na	2	49	+110

*Average of inner and outer leakage. Plus sign denotes an increase in penetration.

Summary

Since ordinary physical and chemical tests do not predict the field performance of a grease and since field operating conditions vary widely, no one piece of equipment is suitable for evaluating the mechanical stability of greases for all applications. Therefore, functional mechanical testers are required for this purpose. Three testers which have proven valuable in this field at the Beacon Laboratories of The Texas Company are the SKF Machine, the Torque Breakdown Machine and the Vibrating Wheel Bearing Tester. In addition, although not an apparatus for subjecting greases to shear, the electron microscope has proven a useful tool in mechanical stability studies.

The SKF Machine is extremely useful in distinguishing between grease types, as well as between products of the same type. Further, when used with a referee grease of known service history, it can be successfully employed to predict the service performance of other products.

The Torque Breakdown Machine has also been found valuable in evaluating the mechanical stability of greases in antifriction bearings. However, perhaps its greatest merit lies in being able to predict the compatible mechanical stability of mixtures of greases.

The Vibrating Wheel Bearing Test is one which duplicates actual service conditions encountered by wheel bearing lubricants more closely than other testers. Although this apparatus is still under development, recent results have shown an encouraging trend toward correlation with field performance. It is intended to continue work on this apparatus in an attempt to improve the correlation and define the limits of reproducibility.

The electron microscope has proven itself advantageous in the study of the mechanical stability of greases. However, if caution is not observed in the interpretation of its data, misleading results can be obtained.

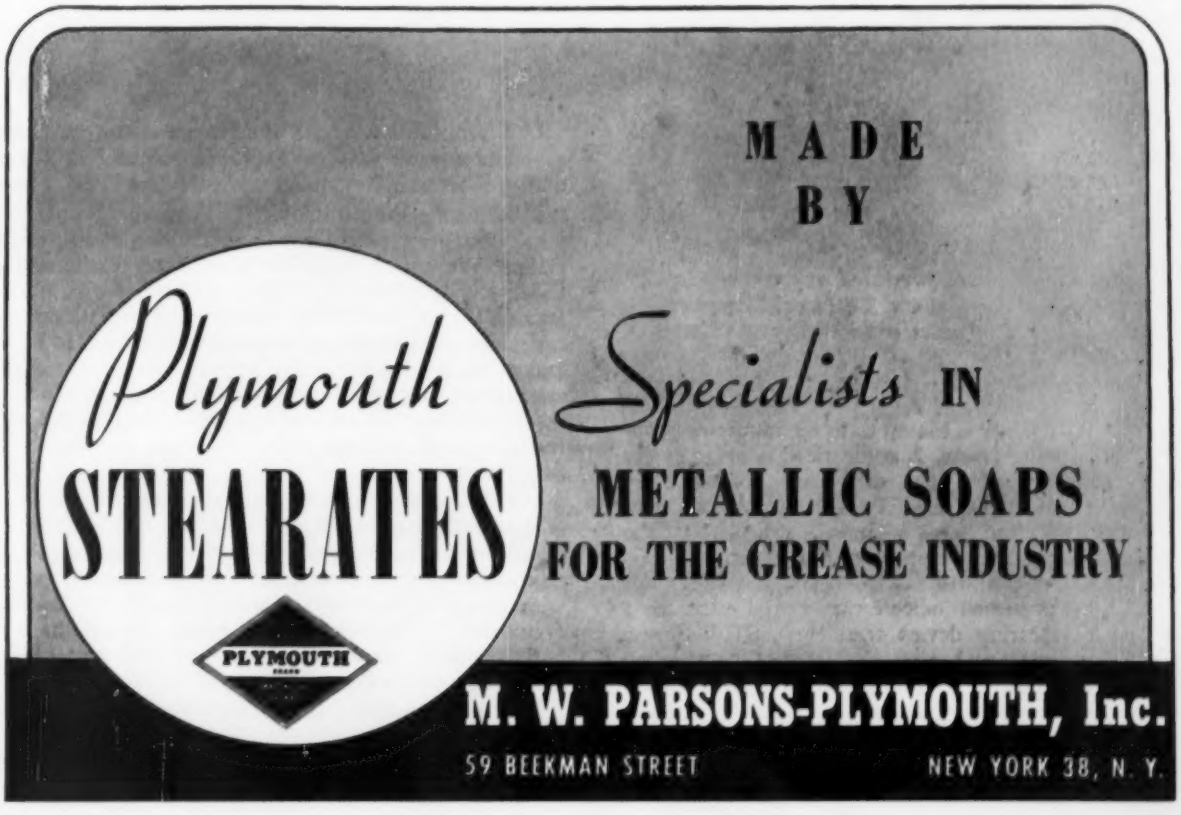


Figure 1. View of grease roll testers showing ovens and instrument panel.

SHELL ROLL

FOR EVALUATING

The following paper was presented during the first section of the ASTM Symposium, Technical Committee G, under the subject "Evaluation of Laboratory Equipment".

SYNOPSIS

Mechanical stability is shown to be an important property of lubricating grease. A comparison is made of the stability shown by various soap base greases when churned in the ASTM Grease Worker and when rolled in the Shell Roll Tester. Some mention is also made of the relation of soap structure orientation to mechanical stability.

The results presented indicate that a need exists for a more severe shearing device than the ASTM Grease Worker for evaluating the mechanical stability of lubricating grease. Also, some provision should be made for determining the shear stability over a wide temperature range. The Shell Roll Tester meets these requirements and is being used extensively. It has provided valuable data and its standardization would be of wide benefit.

Our contribution to this symposium is to relate some of our experience with various types of soap base greases during shear stability studies using the Shell Roll Tester.

Shear or mechanical stability is a desirable property in lubricating grease, especially in antifriction bearing applications. We cannot visualize any application where shear stability is detrimental. It is generally agreed that in antifriction bearing service the bulk of the grease must show little loss in consistency for good retention. However, many factors determine the performance of greases in antifriction bearings. Mechanical stability is but one of these and, therefore, any strict correlation between performance and mechanical stability, per se, would not be expected.

When operating conditions are encountered temporarily which promote excessive slumping and/or churning of the grease, mechanical stability provides a margin of safety. However, if such conditions persist, even greases with excellent mechanical stability ratings break down eventually. To do otherwise, the grease would have to possess infinite shear stability and, to the best of our knowledge, no such product exists.

Mechanical stability has been defined as the lifetime of consistency under a given set of shearing conditions. In the past, the ASTM Grease Worker was considered suitable for evaluating the shear stability of lubricating

TEST

MECHANICAL STABILITY

". . . Mechanical Stability is shown to be an important property of lubricating grease."

By H. A. WOODS and H. M. TROWBRIDGE
SHELL OIL COMPANY

greases available at that time. Later, however, laboratory studies conducted with more severe shearing devices, such as the Shell Roll Tester, led to the introduction of greases showing greater shear stability. As these improved greases show little tendency to soften in the ASTM Grease Worker, even when churned 100,000 strokes, it is apparent that a more severe test is now required. In our experience, the roll tester fills this need.

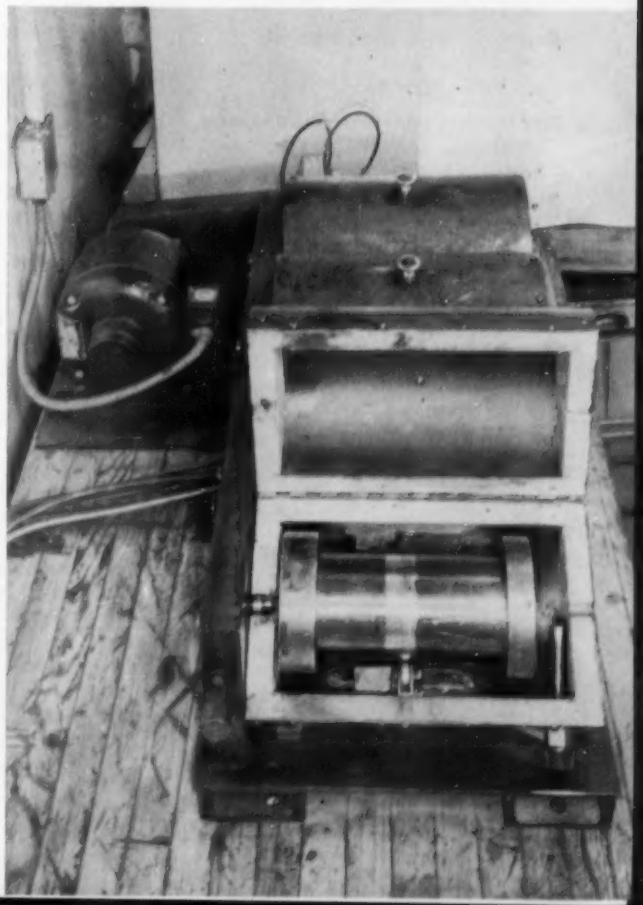
Roll Stability of Various Soap Base Greases

The following graphs present results obtained with various soap base greases during shear stability studies in the roll tester. All greases tested were of NLGI No. 2 consistency. It must be emphasized that although in our experience the results in general are typical of the types of soap base greases indicated, it is possible that wide variations may be obtained using soaps and oils from other sources or using different manufacturing procedures. Also, the additions of various additives, such as corrosion inhibitors and extreme pressure additives, often have a marked influence on the test results.

Photographs of the grease roll test equipment used at the Shell Martinez Refinery Research Laboratory are presented in the first two figures.

Figure 1 shows four roll test ovens and the instrument panel. Figure 2 shows a roll tester mounted in the oven. Figure 3 presents results obtained when rolling calcium

Figure 2. View of grease roll tester mounted in oven.



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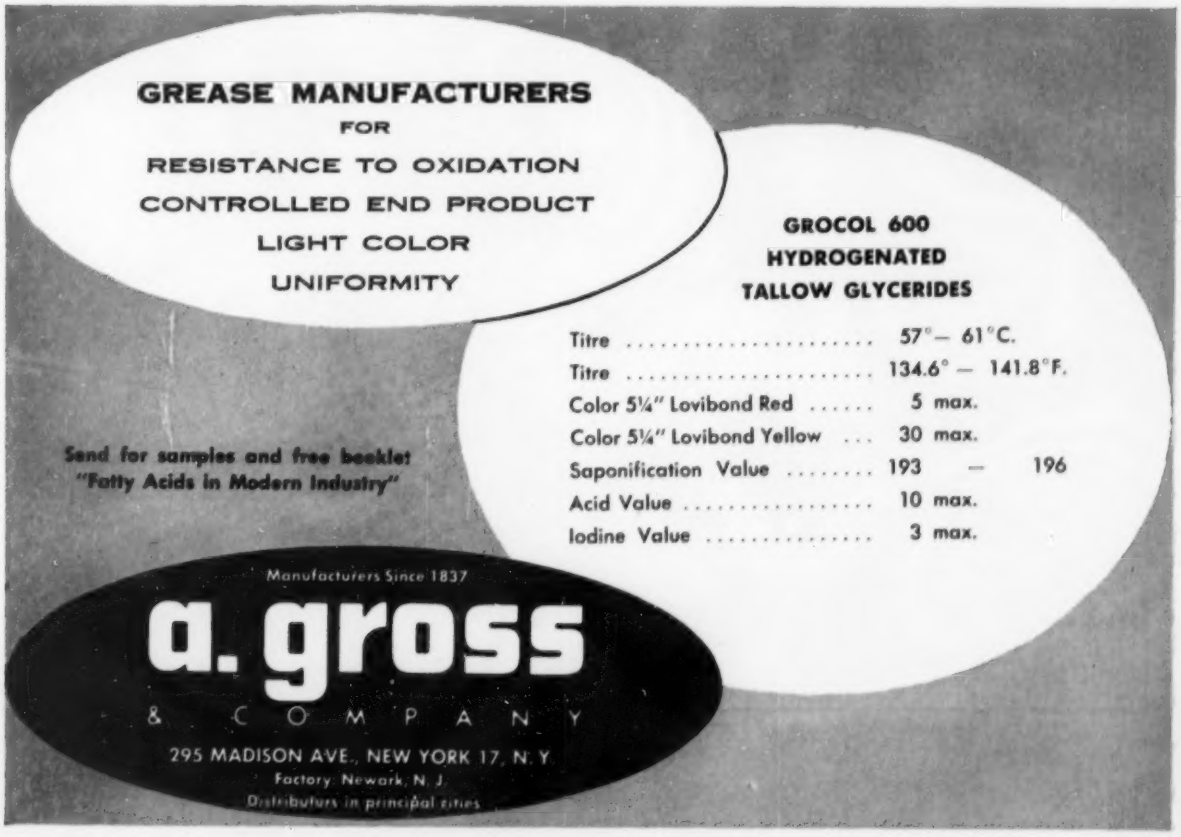

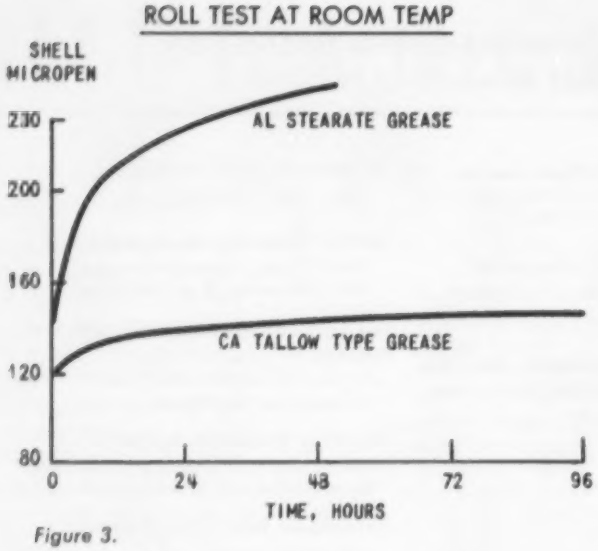

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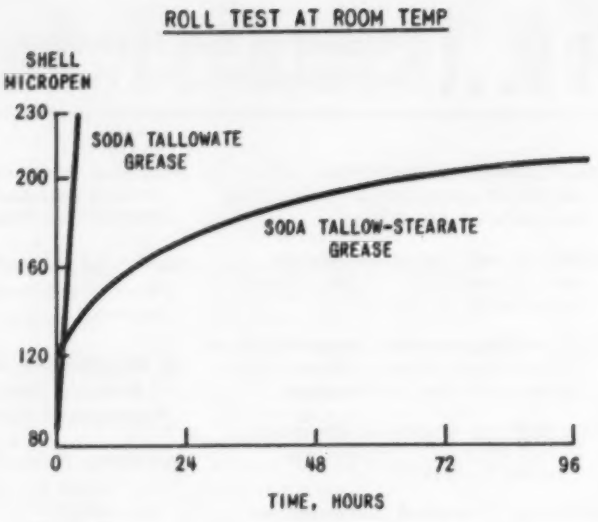

Figure 5.

and aluminum base greases at room temperature. The calcium base grease showed excellent roll stability, whereas the aluminum base grease was only fair in this respect.

Figure 4 gives a comparison of lithium stearate and lithium 12-hydroxystearate greases. The lithium stearate grease softened rapidly during rolling, whereas the lithium hydroxystearate grease showed only moderate softening over a long period of time.

Figure 5 gives a comparison of two sodium soap greases and shows the importance of mechanical stability studies in grease development. Slight changes in formulation made a remarkable improvement in roll stability at room temperature. Figure 6 shows that, when rolled at 212° F., the lithium stearate grease was still poor and that the lithium hydroxystearate grease retained its good mechanical stability.

Figure 7 shows the effect of temperature on roll stability of the sodium tallowate grease. Although the stability was poor at room temperature, a marked improvement was shown at 212°F. This demonstrates the importance of evaluating the mechanical stability of lubricating greases at the temperature of the intended application. This is not feasible using the ASTM Grease Worker.

Table I compares the roll stability of the various greases with the 100,000 stroke penetrations. Although both tests rated the greases in the same order, the 100,000 stroke penetration was not severe enough to sensitively evaluate the true shear stability of the greases. For example, the lithium stearate grease was only 35 points softer than the calcium base grease when worked 100,000 strokes, yet it showed only a trace of the mechanical stability displayed by the calcium base grease in the roll test.

V. A. Elersich in a NLGI Fellowship Report on "Grease Structures"[1] presented some conclusions drawn

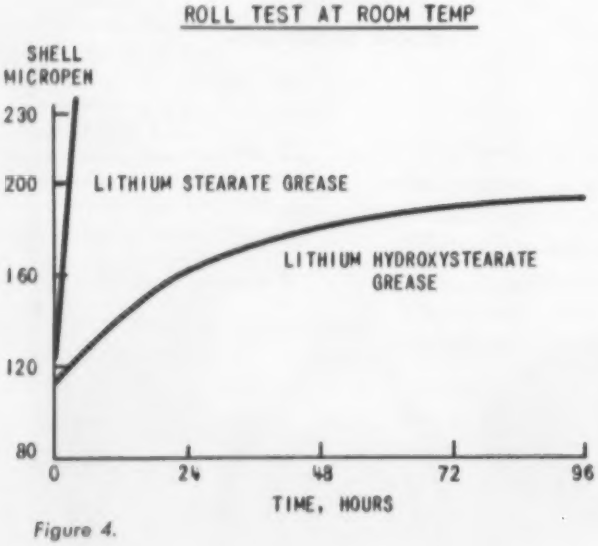

Figure 4.

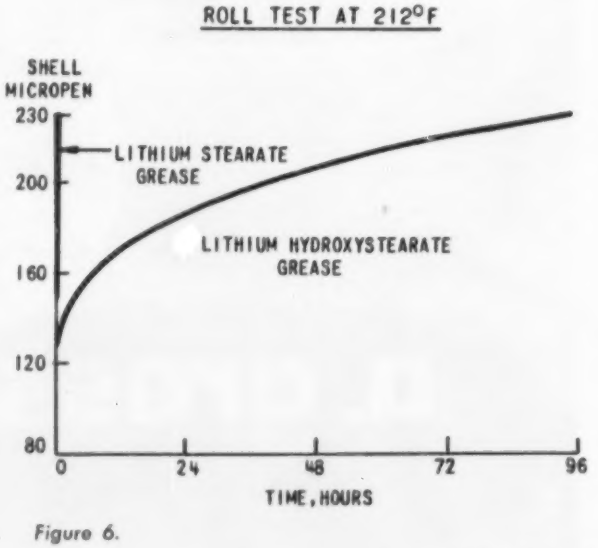

Figure 6.

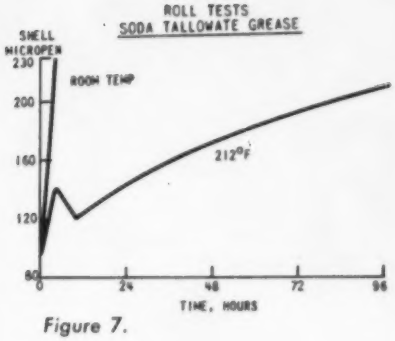

Figure 7.

ROLL STABILITY vs
100,000 STROKE PENETRATION

TYPE OF GREASE	60 STROKE PEN	100,000 STROKE PEN	ROLL STABILITY AT ROOM TEMP, HR
LI HYDROXYSTEARATE	277	286	500 +
CA TALLOW	295	335	500 +
NA TALLOW-STEARATE	282	354	190
AL STEARATE	270	358	27
LI STEARATE	269	370	4
NA TALLOWATE	268	387	4

Table 1.

from electron microscope observations and x-ray orientation analyses which throw considerable light on the differences in shear stability shown by the various types of soap base greases. An aluminum base grease was found to be composed of amorphous masses of tiny, unresolved particles, without any large scale, oriented soap structure. A grease containing 6 per cent lithium 12-hydroxystearate showed the highest degree of orientation with fibers being joined or superposed at distances of 0.5 to 1 micron. A grease containing 16.5 per cent calcium tallow soap showed a considerable amount of coherent structure in which very fine fibers exist along with broader fibril bundles. A soda base grease was composed of elongated ribbons many microns in length, showing little tendency to intertwine or twist into the rope-like structures of the lithium and calcium soaps. These conclusions help to explain the differences noted in our roll test studies.

Roll test conditions are not necessarily constant. Various factors, such as consistency, viscosity, structure, etc., determine the thickness of the grease film between the roller and cylinder wall, and consequently, the shearing stresses to which the grease is subjected during the test. Nevertheless, the roll test is simple, reproducible, and easy to conduct over a wide temperature range. It is used in many laboratories and has provided much valuable data.

Reference

1. Vold, M. J., Elersich, V. A. Baker, R. F., and Vold, R. D., "Grease Structures," NLGI Spokesman, August, 1954, p. 9.

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Patents and Developments

High Pressure Homogenization of Greases

It is well known that greases may be milled at pressures in excess of atmospheric for smoothening texture and for incorporation of additives. However, even under the most severe milling conditions, the grease undergoing treatment is claimed to be rarely subjected to pressures greater than 200 psi. Moreover, the resulting milled grease has a consistency appreciably less than that of unmilled grease.

In U. S. Patent 2,704,363, issued recently to Socony-Vacuum Oil Company, it is claimed that by homogenizing a grease at a pressure greater than 500 psi, and thereafter suddenly releasing the grease from that high pressure to a lower pressure, the resulting grease composition has appreciably improved physical properties, particularly in regard to the consistency of the product so obtained. These improved properties are believed to be due to an internal shear or bombardment within the product which tends to break down the particle size. There is an explosive factor involved which, combined with the shattering effect of discharging the grease through a restricted orifice, tends to disintegrate the lower globules of grease into minute particles.

The greases may be produced in steam kettles, providing that the steam-cooked grease mixture thereafter is passed through a high pressure homogenizer operating at a pressure in excess of 500 psi. The added body imparted to the grease upon passage through the high pressure homogenizer is sufficient to bring the consistency thereof up to the level normally experienced when using a fire-heated grease kettle. This is claimed to be of considerable value when one considers that the majority of grease plants in this country are not equipped with fire kettles or other means for heating the contents to above 325°-350° F. Furthermore, fire hazards would be minimized.

A suitable apparatus for effecting the process is shown in the accompanying drawings. As shown in Figure 1, a charge of oil plus thickening agent is conducted into pressure kettle 1 through pipe 2. The kettle is heated by steam introduced through pipe 3. After saponification, etc., the stock is blown by pressure through pipe 5 into an open finishing kettle 6 heated by steam entering through pipe 7. Cut-back oil is conducted into the finishing kettle through pipe 9. After thorough agitation, the kettle contents are withdrawn through outlet 10 and pumped through pipe 11 and passed through high pressure homogenizer 13. By proper manipulation of valves 14 and 15, the homogenized grease may be conducted either through filter 16 and then to packaging, or it may be recycled through line 17 for more homogenization.

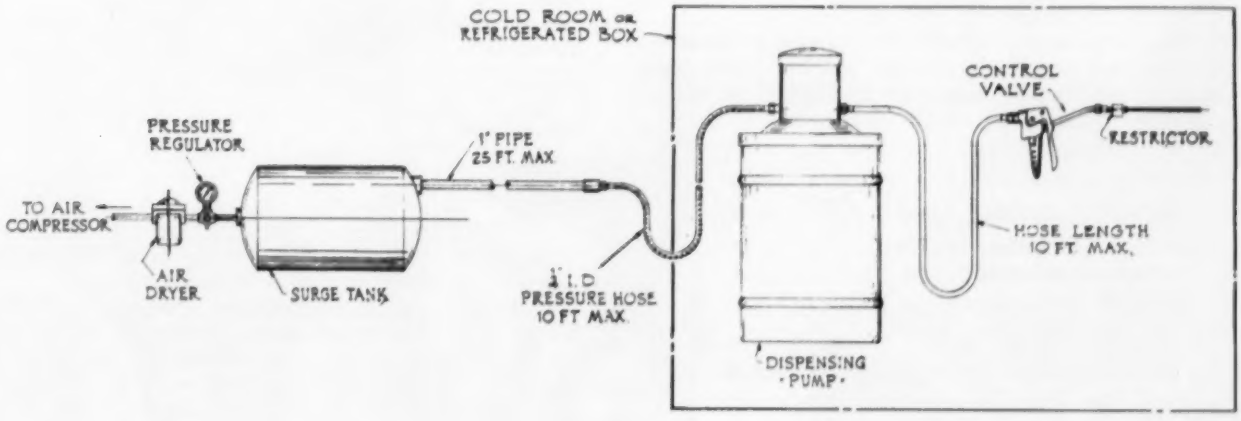
Figures 2 and 3 are sectional views giving more details of the high pressure homogenizer 13 having a valve assembly 21 provided with a seat ring 24, impact ring 25 and valve head 26. The orfice is defined by impact ring 25 and valve head 26.

One example of a grease prepared according to this patent is as follows:

A mixed lithium, calcium, and sodium base grease was prepared according to the following formula:

	Per cent by Weight
Lithium stearate	8.00
Calcium stearate	2.00
Caustic soda	0.13
12-hydroxy stearic acid	1.00
Oxidation inhibitor (1.25% barium salt of diwax benzene sulfonic acid+0.2% phenyl alphanaphthylamine)	1.45
300 sec. at 100° F.S.U.V. mineral oil	87.42

The above formula was used for making two batches of grease, one by convention fire kettle cooking and the other by cooking in a steam kettle followed by passage through a high pressure homogenizer.



· TEST ASSEMBLY ·
FOR DETERMINING THE DELIVERY CHARACTERISTICS OF PUMPS
FIG. 1

The grease prepared by fire kettle cooking was made by charging a fire kettle with 50 per cent of the mineral oil, the hydroxy stearic acid and a 50 per cent by weight aqueous solution of the caustic soda. Thereafter, the paddles of the grease kettle were set into motion and the temperature of the kettle was slowly raised. After agitating the above mixture for about 5 minutes, the dry lithium and calcium stearates were charged to the kettle. The temperature was then increased to 370-390° F. and the balance of the mineral oil and the oxidation inhibitor were added. The resulting mixture was then heated to a temperature of 400-420° F. for a period of 30-40 minutes and then drawn into cooling pans. After the product was cooled to room temperature, which usually took 10-12 hours, the grease blocks were transferred to a milling kettle and the grease was milled until the ASTM worked and unworked penetration were essentially the same value. The resulting grease was thereafter conducted into shipping containers.

The grease prepared by steam kettle cooking and high pressure homogenization was made by charging a steam kettle with 50 per cent of the mineral oil, the hydroxy stearic acid and a 50 per cent by weight aqueous solution of the caustic soda. The paddles of the kettle were set into motion and steam pressure was charged to the jacket of the kettle, raising the temperature to 250° F. After the above mixture was agitated for about 5 minutes, the dry lithium and calcium stearates were charged to the kettle. Thereafter, the system was maintained at a temperature of 290-320° F. and evacuated to under ten inches of mercury for a period of one hour. Then the vacuum was reduced to atmospheric pressure and the kettle opened. The mixture was pumped from the bottom of the kettle, passed through a high pressure homogenizer operated at a pressure of 2000-3000 pounds per square inch and then led back into the top of the kettle. During the homogenization, the balance of the mineral oil and the oxidation inhibitor were added and the jacket temperature of the kettle was reduced to about 250° F. by cooling with water. The homogenization of the grease was continued for 1 to 1½ hours. The resulting grease was thereafter conducted into shipping containers at a temperature of 200-220° F.

The comparative properties of the grease produced by conventional fire kettle cooking and by steam kettle cooking plus homogenization are set forth in the following table:

	Fire Kettle	*Steam kettle plus High Pressure Homogenization*
ASTM Worked Penetration	327	305
Decrease in Consistency (points softening as measured by the Shell Roll Test)	27	12
ASTM Dropping Point, °F	358	370
Manufacturing Temp, °F	400	320
Cooking Time, hours	3	2
Cooling Time, hours	10	1½
Milling Time, hours	5	0
Total Hours for Mfg.....	18	3½

It will be noted from the foregoing table that the grease prepared by steam kettle cooking and homogenization had an improved consistency over the grease prepared by conventional fire kettle cooking, as indicated by the ASTM worked penetration test. The homogenized grease also possessed greater mechanical stability as indicated by the smaller decrease in consistency when subjected to the shell roll test. The description of this test is set forth in detail in the Institute Spokesman, volume VI, No. 12, page 1, March 1943. It is to be further noted that the operating temperature of the novel process was 320° F. as compared with a temperature of 400° F. required in the conventional fire-cooking procedure. It is still further to be noted that the total operating time was reduced from a total of 18 hours in the conventional fire-cooking process to 3½ hours for the steam-cooking and homogenization procedure of this invention.

Aluminum Distearate Greases

Aluminum stearate is made commercially by reacting a water solution of the sodium soap of the commercial fatty acid with a solution of an aluminum salt, generally the sulfate. The resulting slurry of insoluble aluminum stearate is filtered, washed, dried, and ground to uniform particle size. In general, stearates with aluminum to fatty acid ratios corresponding to the distearate have proved most effective in the preparation of lubricating greases. Ordinarily, these aluminum soaps are added to hydrocarbon mineral oils in the ratio of about 4% to 12% or more of the soap to 96% to 88% hydrocarbon oil. The grease is compounded by heating the mixture until maximum dispersion of soap in oil is obtained. The grease is then cooled under controlled conditions during which the optimum gel structure is built up in the grease.

In U. S. Patent 2,702,792 issued to American Cyanamid Company, it is claimed that the gel-forming power of aluminum distearate can be greatly improved by forming the anhydride which is characterized by the substantial absence of chemically combined water and is not to be confused with the dehydrated soaps in which only physically present water has been removed. This dehydration to produce the anyhydride is effected by heating the previously dried aluminum distearate with agitation at 160°-180° C. or higher for a length of time (1-5 hours) sufficient to remove all of the chemically combined water. The anhydrides are white solids.

A suitable material for producing such anhydrides is hydrogenated fish oil fatty acids having the following composition:

	Per Cent
$C_{21}H_{43}COOH$	20
$C_{19}H_{39}COOH$	20
$C_{17}H_{35}COOH$	23
$C_{15}H_{31}COOH$	30
$C_{13}H_{27}COOH$	7

An example of a lubricating grease prepared in accordance with the patent is given as follows:

An aluminum soap was prepared from hydrogenated fish oil fatty acids by the method previously described; i.e., by adding aluminum sulfate solution to a water solution of the sodium soap of the acids at 70° C., washing the resulting precipitate free from sodium sulfate, and drying in a current of hot air on a belt dryer. The dried soap contained 1.0% moisture and 8.74% Al_2O_3 and was composed essentially of aluminum distearate.

Samples of this soap were heated for 90 minutes in open containers suspended in oil baths at varying tem-

peratures. Where necessary, the heated material was ground and screened to 40 mesh. Greases containing 10% of the soaps were then made in a hydrocarbon lubricating oil having a viscosity of 300 at 100° F. and tested with the penetrometer both in unworked condition and after working for 60 strokes. The test results are shown in the following table, in which penetrations are in tenths of a millimeter.

	Penetration of Greases	
Heating Temp., ° C.	*Unworked*	*Worked*
110	158	267
160	154	251
180	150	242
210	143	240
240	139	223
265	135	208

These results show clearly the increase in gel strength that follows the formation of increasing amounts of aluminum distearate anhydride in the aluminum soap composition as progressively higher heating temperatures are used. Tests made by heating samples of the same soap at 160° C. for increasing times show a much slower increase in gel strength; thus, for example, a grease prepared with the same quantity of the same hydrocarbon oil, but using a soap heated at 160° C. for 2½ hours showed a penetration of 152 unworked and 250 worked. It is evident, therefore, that the anhydride is not formed by the stagnant heating of aluminum distearate soaps at temperatures much below 160° C. At temperatures above 160° C., however, the anhydride formation is quite rapid.

NEWS ITEMS

Grease fittings with a ball in the tip, to keep the dirt out, were introduced by Aro Eqt. Corp., Bryan, Ohio. A spring holds the ball in sealing position. An enlarged inner passage admits grease more quickly. (Nat. Petr. News 4/55 p. 179).

What to look for in choosing grease-making equipment—Yarham (Petr. Processing 4/55 p. 505.)

Effects of shear on lithium greases and their soap phase—progressively larger amounts of shear or increasing shear rates applied to a grease do not necessarily result in a progressively lower consistency—Renshaw (Ind. & Engrg. Chem. 4/55 p. 834).

A. L. Watson Co., Milton, Mass., introduced an attachment for grease cups which makes the cup stay up high on its stem when full of grease and to sink downward gradually as it empties. It is claimed that for the first time, users will get a visible and dependable control on how much grease is required. (Wall St. J. 2/11 p. 7).

A "brand new" silicone lubricant, now tested at Westinghouse, was developed by introducing new chemical groupings in partial replacement of silicon-linked hydrocarbon groups. By replacing phenyl with halogenated phenyls, the lubricity of the silicone is said to be considerably increased at little expense to thermal stability. Of the halogenated-phenyl derivatives synthesized and evaluated, 3-trifluoromethyl—4—chlorophenyl was most effective in reducing wear by the Falex test. The new lubricant also was said to have performed well in turbojet engines and will be produced by Dow Corning Corp., Midland, Mich. for $5-$10/lb. (Avia. Week 1/31 p. 43).

Monsanto Chemical Co., St. Louis, announced commercial availability of its Santopoid-44 gear lubricant additive, as making possible lubricants which will protect car and truck gears against the increasing severe stresses imposed by greater speeds and power (Oil, Paint & Drug Rep. 1/17 p. 41.)

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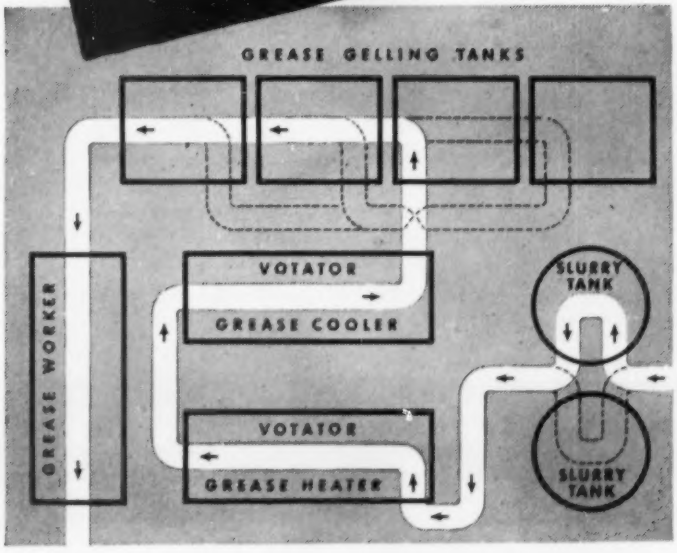

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Technical Committee

Chairman T. G. Roehner, Director of the Technical Service Department, Socony-Mobil Laboratories

The deadline was June 15th for the ballots regarding adoption of the Tentative NLGI Method for Matching Lubricating Grease Flow Properties with Lubricating Grease Dispensing Pump Delivery Behavior at Low Temperatures. Mr. N. Marusov, Chairman of the NLGI Dispensing Subcommittee, has reported that no negative votes were received.

The program for the Panel Discussion on Lubricating Greases for Modern Farm Machinery is rapidly approaching finalization. At this date definite offers for lead-off papers have been received from Mr. Fred Bremier of Curtis Publishing Company, regarding "The Farm Market"; Mr. N. A. Sauter of the John Deere Company, under the title "Modern Farm Machines Need Modern Greases"; and Prof. B. A. Jones, of the Agriculture Engineering Department of the University of Illinois. The Committee has also received so many tentative offers that there is no doubt that the program will be well-balanced and that it will stimulate constructive discussions from the floor.

Good progress is also being made on the program for the Symposium on Flow Properties of Lubricating Greases. Dr. Henry Eyring, Dean of Graduate School, University of Utah, has agreed to submit one of the lead-off papers covering the fundamental aspects of the subject. Tentative offers have been received for papers dealing with rheological problems. A particular effort is being made to obtain authoritative lead-off speakers who will present the so-called practical side of the subject, not only in respect to the flow of lubricating greases in dispensing equipment but also in bearings operating under service conditions. In other words, provision is being made for recognition of a wide range of viewpoints, varying from laboratory research to plant lubrication engineering.

Patents and Developments

Continued from page 33

Metal & Thermit, 100 E. 42nd St., New York 17, advertised pilot plant availability of solvent-free stannous soaps: stannons octoate and oleate, yellow viscous fluids containing 28% and 17% tin, respectively (Chem. Week 1/15 p. 81).

Spectrographic method for analyzing lubricating greases—Key et al (Anal. Chem. 12/54 p. 1900).

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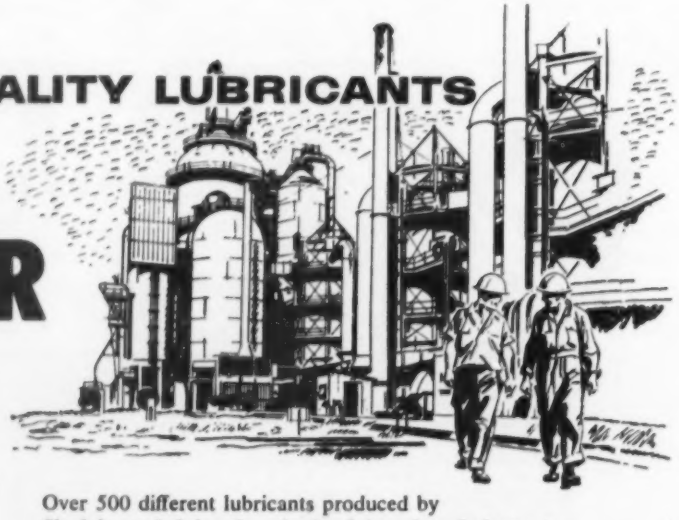

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PEOPLE in the Industry

Morehouse-Cowles, Inc. Holds School of Instruction

On June 3 and 4, Morehouse-Cowles, Inc. of Los Angeles, distributors nationally of Cowles Dissolvers, held a school of instruction at the Cowles Dissolver Company plant at Cayuga, New York. Technical classes were held, laboratory demonstrations made, and full scale production equipment runs with Cowles Dissolvers were staged for an audience of field representatives serving industry east of the Mississippi and representatives from Eastern Canada. The technical classes covered practically all products now being processed by Cowles Dissolvers, methods of handling, accessory equipment requirements, special engineering features, controls, horse power problems, and related subjects. Laboratory demonstrations approached a processing problem as encountered in an actual plant operation (1) by lab approach, and then (2) carrying the lab findings to production plant equipment. Glenn H. Morehouse, president of Morehouse-Cowles, Inc. said that successive periods of training such as these have been found highly successful in helping Morehouse-Cowles field representatives assist the industries they contact solve many processing problems.

MOREHOUSE-COWLES, INC., field representatives at Cayuga conference

G. Daniel Davis Appointed Executive Vice President Of Nopco

Harrison, N. J.—G. Daniel Davis has been named to the post of Executive Vice President of the Nopco Chemical Company. The announcement was made by Ralph Wechsler, President of Nopco, following a recent meeting of the Board of Directors.

G. DANIEL DAVIS

In his new position, Mr. Davis will have full responsibility for the operation of the Industrial Division of Nopco including sales, production, and product development. As one of his first concerns, he intends to make a study of the sales operation of the division to determine how it can be improved and expanded for the most efficient handling of the company's growing sales.

Its subsidiary, the Metasap Chemical Company, manufactures zinc and aluminum stearates for such industries as the manufacture of paint, varnish, lacquer, grease, plastics, ink, metallurgy, construction materials, textiles, cosmetics, ceramics, and paper.

Nopco Names New Sales Manager for Its Industrial Division

Walter B. Morehouse has been appointed General Sales Manager of the Industrial Division of the Nopco Chemical Company, according to a recent announcement made by G. Daniel Davis, Executive Vice President of the company.

He will also be in charge of the Sales Division of the Metasap Chemical Company, a subsidiary of Nopco, which produces insoluble metallic stearates for a great many industries including the manufacture of paint, varnish, lacquer, grease, plastics, ink, metallurgy, construction materials, textiles, cosmetics, ceramics, and paper.

WALTER B. MOREHOUSE

A chemistry major, Mr. Morehouse is a graduate of the College of Forestry of the State University of New York. He has been associated with Nopco since 1940, and was named an Assistant Vice President of the company in 1953. He is an active member of the Technical Association of the Pulp and Paper Industry, and an Associate of the American Pulp and Paper Mill Superintendents Association.

In addition to his new assignment, Mr. Morehouse will continue as Manager of the Paper Chemicals Division.

Socony Mobil Appoints Eight

M. M. Beckes, manager of the newly-created operating department of Socony Mobil Oil Company, Inc., has announced eight appointments. They are: C. W. Pease, wholesale plant manager; L. E. Reed, motor vehicles manager; E. M. Prudames, retail plant and equipment manager; H. W. Gerlach, administrative assistant; L. F. Deditius and A. W. Dudley, operating analysts; J. T. Carpenter, petroleum losses analyst; and R. J. Whitley, motor vehicle engineer.

The new unit replaces the Eastern Region operating department and functions as a staff department of the domestic marketing organization.

Joseph Jenkins Named Sales Manager, Industrial Division, At Lincoln Engineering Co.

As announced by Lincoln Engineering Company, manufacturer of Lubrication Equipment, St. Louis, Missouri, Joseph J. Jenkins has been appointed Sales Manager, Industrial Division after 15 years with the Company.

W. S. Rheem II Elected

William S. Rheem II, general manager of the Rheem Manufacturing Company, was today elected to the corporation's board of directors and named a vice-president of the company by the Rheem board, it was announced by president R. S. Rheem.

The new officer is a member of the third generation of a pioneering western industrial family. His grandfather, W. S. Rheem, was president of the Standard Oil Company of California. His father, R. S. Rheem, together with the latter's two brothers, D. L. Rheem and W. K. Rheem, was a cofounder of the Rheem Manufacturing Company, which started as a small galvanizing plant in Emeryville, California, in 1925, and has since grown to world-wide proportions. Today, the company operates through 14 plants in the United States and 17 plants overseas.

William S. Rheem II joined the company in 1937 as a shop worker during vacations. He graduated from Brown University in 1944, and after serving in the United States Navy as an ensign, he returned to Rheem. He was then employed in various production and administrative capacities, becoming assistant general manager in 1953. A year and a half ago he became general manager in charge of the company's four operating divisions.

Foote Mineral Appoints R. J. Longenecker

Appointment of Robert J. Longenecker to the sales staff of Foote Mineral Company has been announced by John D. Clark, manager of Ceramic Sales. Formerly a member of the Research and Development Laboratories, Longenecker has had over four years experience in ceramic research.

Longenecker will be charged with product development, particularly in whitewares, a field in which he has specialized since joining the company in 1953.

A graduate of Pennsylvania State University, Longenecker received his bachelor's degree in ceramics in 1951. He is a member of the American Ceramic Society, and Alpha Phi Omega and Alpha Chi Sigma fraternities.

Lubrication Engineers Elect New Officers

J. W. Hopkinson, President of the Penn-Petroleum Corp., Detroit, Mich., was named the new President of the American Society of Lubrication Engineers at their 1955 Annual Meeting. W. Deutsch of the Trabon Corp., Cleveland, Ohio, was elected Vice-President at Large; E. R. Booser, General Electric Co., West Lynn., Mass., is the new Secretary, and W. H. Fowler, Jr., of the Pure Oil Co., Chicago, Illinois, is Treasurer for the term 1955-56.

Regional Vice-President elected were G. R. Armstrong, Canadian, with B. Greening Wire Co., Ltd., Hamilton, Ont., Can., E. D. Harkins, Sr., Midwestern Farval Corp., Indianapolis, Ind., J. O. McLean, Eastern, Reynolds Metals Co., Richmond, Va., and M. H. Sperling, Western, of Richfield Oil Corp., Los Angeles, Calif.

Directors elected were: J. H. Fuller, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., J. D. Lykins, Wheeling Steel Corp., Wheeling, W. Va., W. H. Millett, Carbide and Carbon Chemicals Co., New York, N. Y., A. E. Roach, Research Labs. Div., General Motors Corp., Detroit, Mich., and C. R. Schmitt, E. F. Houghton & Co., Philadelphia, Pa.

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NLGI PAST DIRECTOR TO NEW POST

P. V. Keyser, Jr. Elected Socony Mobil Oil Director

P. V. KEYSER, JR.

Socony Mobil Oil Company, Inc., elected a new board chairman, a new president, and two new directors, the elections to become effective July 1.

B. Brewster Jennings, president since 1944, was made chairman of the board of directors of the company to succeed George V. Holton, who retires July 1. Albert L. Nickerson, vice president and director in charge of foreign trade, was chosen president, succeeding Mr. Jennings. Austin T. Foster and Paul V. Keyser, Jr., were elected directors.

Mr. Keyser, 49 years old and a B.S. and M.S. graduate of the Massachusetts Institute of Technology, has been with the company since 1930. He started in the technical service department of the company's laboratories, in Brooklyn, and was made manager in 1938. In 1944 he became head of the research and development laboratories in Paulsboro, N. J. He became manager of the lubricating department at 26 Broadway, in New York, in 1947 and in 1951 became manager of domestic marketing. He moved to the company's foreign trade department in January, 1955. He has also served the industry as a Director of the National Lubricating Grease Institute. He lives in Douglaston, N.Y., with his wife and daughter.

Socony Mobil Oil Announces New Dealer Relations Policy

An 11-point dealer relations policy has been announced by Vern A. Bellman, national marketing manager of Socony Mobil Oil Company, Inc.

Under one of the points in the policy, the Company is increasing the number of three-year leases. The point says: "In those cases where we lease property to dealers, we offer leases for terms as long as three years to those dealers who conduct their businesses in a responsible fashion, who have demonstrated over a period of time that they will maintain or enhance the value of the property and who are financially sound."

The new program is being presented to Mobilgas dealers through group meetings, individual conferences and letters from field managers. It was first introduced to dealers in three sales districts—St. Louis, Detroit, and Pontiac, Michigan—early in May. After the details of the presentation were tested in these three districts, the program was started in other districts.

Work on the program was started a year and a half ago through a Dealer Relations Committee, consisting of representatives of the Mobil sales organization throughout the country.

"We plan to keep this committee functioning," Mr. Bellman said. "While we believe the program we have adopted will contribute to further improvement in our dealer relations, we are asking this committee to make continuing studies of it and to recommend additional steps to be taken in the future."

The new dealer relations program is a sequel to a distributor relations program which the company put into effect three years ago.

New Plant for Continental Can

Continental Can Company will start construction next week of a new one-story plant in Midland, Mich., for the manufacture of fibre shipping drums, it was announced today by Carl E. Eggerss, vice president in charge of the company's fibre drum division.

Located on a 30-acre site on Second Street, the new plant should be in production by December this year and will employ approximately 125 persons. The construction contract has been awarded to the LaSalle Construction Company of Chicago.

The building, containing approximately 140,000 sq. ft. of floor space, will be equipped to meet the fibre drum needs of the state's chemical and food industries. With seven railroad docks and eight truck spots, the plant will be served by the New York Central railroad.

"We are very pleased to announce this expansion of our fibre drum division in Michigan," Mr. Eggerss said. "We feel that our new plant will be strategically located to provide faster and more efficient service to the industries of this area."

At the present time, the company operates five other fibre drum plants.

Industry NEWS

General Lubricants Goes Out of Business

More eloquent than anything we can say here is the following release by the General Lubricants Company announcing they are going out of business. Active Members of NLGI, it is with sincere regret we see them leave the lubrication industry. Here is what they say in their farewell message:

"With sadness we announce to our customers and friends that we are going out of business after 35 years. Three generations of Pomeroys, grandfather, father and sons, have enjoyed the friendships, stimulation and challenge found in doing business through the years. We are going out of business because the present management, Bruce and Bob, have decided upon other fields of endeavor, so we liquidate the General Lubricants Company with sadness, but prepare to enter our new endeavors with the hope and gladness of one whose secret inner desires are about to be fulfilled.

Bruce left the company four months ago to spend full time in the field of politics. Although he was unsuccessful in the race for Mayor of Minneapolis, he made such a good showing that he plans to try again. In the meantime he plans to do work in radio and television and public relations.

After much serious thought and prayer, I have decided to go to seminary for three years to study for the Christian ministry. With the valuable lessons I have learned in business, and the academic study I'll do in seminary, plus the spiritual growth and development I hope to acquire there, I shall be able to serve God and my fellow men more fully.

To our customers, we say thank you for the many years we have been able to serve you, and the warm personal friendships that have come from knowing and working with you. We pledge our full support and cooperation in helping you find new suppliers who will give the same courteous service and high quality products. If you wish, we will help you by investigating other local grease plants and recommend the ones which we feel will be able to supply you adequately. We will work with your new supplier, giving them our formulations and testing procedures and specifications so that you will be assured of an uninterrupted supply. We will turn over to your new supplier whatever lithographed containers of yours we may have in stock, and see that they are informed of the proper methods for marking and labeling your products. We are sure that the transition can be made rapidly and smoothly, and we hope to complete it during the month of July.

To our other friends, suppliers and competitors, we say thank you for the many years of cooperation and good healthy competition. We've enjoyed it a lot, and knowing and working with each of you has been a real pleasure. Our land, buildings, supplies and equipment are offered for sale, and if there is anything which you may need in your operation, we'll be happy to discuss it with you.

So we'd like to say "so long" rather than sad goodbyes, and give you all our warmest wishes for happiness and success, both business and personal, in the future years."

ROBERT F. POMEROY

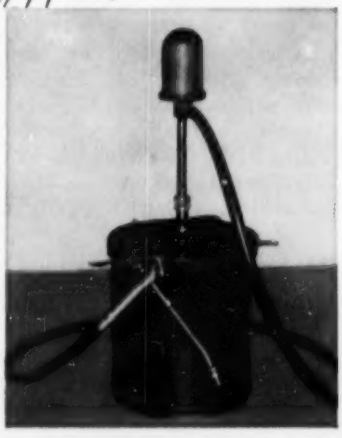
Four Sales Regions Announced By Witco

Major reorganization of the domestic sales force of the Witco Chemical Company into four regional units, each under the supervision of a resident regional vice-president, is announced by Max A. Minnig, Executive Vice President of the company.

Basic reason behind the major realignment is described as a streamlining of the sales operation to provide better customer service and convenience. The four new regions are desig-

NOW THE Super HEAVY DUTY GRE-ZER-ATOR

*An all-weather grease gun designed especially for lithium and other multi-purpose greases.



- New Hydrojet Pump gives greater pump pressure and capacity. Requires neither air, electrical connections . . nor regular filling of air in pump unit.
- Reversabout Pressure Booster allows push or pull handle operation—can develop more than three tons of pressure.
- Complete one-unit operation — always ready for instant use.
- No special filling equipment required—offers convenient and continuous lubricating service.
- All-steel construction and rust-resistant finish makes the new Heavy-Duty GRE-ZER-ATOR a rugged and dependable unit.

Write for complete information on all Zee Line equipment. New regular model Gre-Zer-Ator is available now. Let us serve you.

NATIONAL SALES, INC.
812 NORTH MAIN • WICHITA 5, KANSAS

for exacting, specialized lubricating jobs

PENOLA AUTOMOTIVE LUBRICANTS

GREASES
CUTTING OILS

are laboratory engineered, quality-controlled and tested for your protection.

Penola

PENOLA OIL COMPANY
15 West 51st Street, New York 19, N.Y.

nated as Eastern, Ohio and Southern, Midwest, and West Coast.

"Responsibility for all sales functions in the region now lies with the four vice presidents who are assuming increased burden," Mr. Minnig said. "This will assure better understanding and more rapid consideration of the customer's problems, and also closer contact between Witco and our customers."

"Our former system," Mr. Minnig added, "involving nine district offices, was very effective. However, due to increased activities, we have been forced to reorganize and streamline our sales operation."

The Eastern region, embracing the New England States, majority of New York and Eastern Pennsylvania, and extending south to the Virginia-North Carolina state line, will be headed by Michael Vaccaro, whose headquarters will be in New York. Witco's Boston sales office, under the direction of C. W. Grubb will be retained.

The Ohio-Southern region, including the southern states, Ohio and Western Pennsylvania, will be supervised by Harry M. Brubaker, with offices in Akron, Ohio. Witco's Atlanta office will be retained under the direction of C. A. Damen.

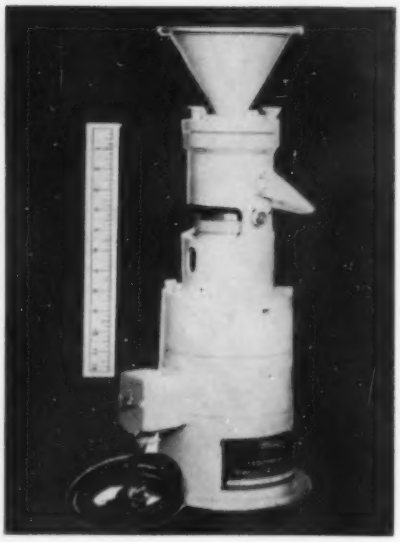
The Mid-West region, extending from Indiana to the Rocky Mountains and south to Texas and Louisiana, will have headquarters in Chicago, under the supervision of Jerome S. Harrison. Witco's Houston office under direction of A. B. Craig, will be retained.

The West Coast region, under direction of Stanley M. Freeman who will continue to be located in Los Angeles, will include all states west of the Rockies. Witco's San Francisco office under supervision of W. J. Butler, will be retained.

Morehouse Introduces New Stainless Steel Research Mill

Development of a small, light weight, *all stainless steel* mill to answer the needs of general research has been announced by Morehouse Industries, Los Angeles manufacturer of high-speed stone milling equipment.

Known as Model SS-200, the unit was designed especially for product development, laboratory control work, and standardization of volume production formulas. Formulas and production procedures, when solved with the small mill, may then be transferred to the large-volume Morehouse production mills. Morehouse engineers point out that expenses of production stoppages and formula adjustments may thus be saved.



New "midget" Morehouse laboratory mills

As in the larger Morehouse Mills, high-speed, non-contaminating grinding discs are made of aluminum oxide "aloxite" by The Carborundum Company. The SS-200 measures just 23½" high, 8¼" in diameter. Throughput rate is from 1 to 3 gallons per hour. Motor is either explosion proof or totally enclosed, ¾ HP, available in two- or three-phase only, for practically any required voltage and cycle characteristics, for either continuous or intermittent operation.

In addition to its research applications, the SS-200 may be used by manufacturers in small batch production and demonstration of production formulas. Morehouse production mills are widely used in the manufacture of food products, pharmaceuticals, drugs, chemicals, biologicals, lubricating greases and cosmetics.

For complete details on the Morehouse SS-200 laboratory mill, write to Morehouse-Cowles, Inc., 1150 San Fernando Road, Los Angeles 65, California.

Crescent Corporation New Name for Deep Rock

Deep Rock Oil Corporation has announced that the Board of Directors has approved a change in the name of the corporation to Crescent Corporation. The new name will be submitted to the stockholders for approval at a special meeting to be held in Tulsa July 12.

The present directors of Deep Rock will continue with Crescent. W. H. Garbade continues as President, with W. F. Styler, Jr., as Vice President and Treasurer, and C. A. Houy as Vice President in charge of Exploration and Production.

H. A. Tallman continues as Manager of the Legal Department, and N. K. Anderson as Director of Research and Engineering. The Exploration and Production Division will operate with H. R. Bolton as Manager of Production, R. B. Hurlbutt, Jr., as Chief Geologist, A. D. Benedict as Manager of the Land Department, and J. M. Moore as Office Manager and Purchasing Agent.

Other officers are O. O. Kerr, Secretary; R. N. Tuggle, Assistant Treasurer; and Nye McLaury, Assistant Secretary.

Crescent's properties include interests in 28 producing wells in the Jameson Field, Coke County, Texas; the Many Islands gas field, Alberta, Canada; 2,300 acres in the Haines Field, Cass and Marion Counties, Texas; and extensive royalty interests throughout the mid-continent area. At present, net production amounts to approximately 1,300 barrels a day.

In addition, Crescent will operate, through its wholly owned subsidiary, Hugoton Plains Gas and Oil Company, 178 gas wells in the Hugoton Field of Kansas and Oklahoma and a gas processing plant near Tyrone, Oklahoma. Crescent also retains its stock interest in American Independent Oil Company, which has holdings in the Kuwait-Saudia Arabia Neutral Zone.

Crescent's interest in 5,200,000 acres in Cuba was transferred, in exchange for stock, to Siboney Development and Exploration Company, recently formed to explore these concessions. It is anticipated that additional stock of Siboney will be of-

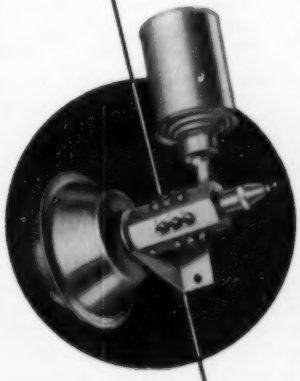
Lincoln ENGINEERING COMPANY
announces
THE *Multi-Luber** SYSTEMS
FOR POWER LUBRICATION

Applications Unlimited . . .

AIR-OPERATED

Adopted by leading Fleet and Bus Operators for automatic, controlled lubricant application each time driver applies the air brake. Complete Systems available in handy kits for simple installation. Air-Operated Multi-Luber Systems may be used wherever compressed air is available to reduce operating costs and increase efficiency on equipment ranging from transport trailers to automated, high speed lathes.

Where compressed air is not available, the air cylinder of the Multi-Luber can be replaced with a push button. These Manual Systems are available in kits for quick installation on tractors, farm implements, and a wide range of industrial machinery.



VACUUM-OPERATED

Multi-Luber Systems are also available for instantaneous, automatic lubrication of equipment ranging from light trucks to fork lift trucks, or for any application where vacuum is available. A touch of the control button, located wherever desired, delivers a pre-measured quantity of refinery-pure lubricant.

AND NOW . . . AVAILABLE ON 1955 model LINCOLN and MERCURY motor cars

Here is the newest and most revolutionary application of Lincoln's vacuum-operated Multi-Luber System. Now, purchasers of new Lincoln or Mercury motor cars have available instantaneous Power Lubrication at their own convenience. A mere touch of a button on the instrument panel provides the continuous pleasure of smoother car performance, greater steering ease and increased operating economy.

*Trade Name Registered Patent Pending

Lincoln Engineering Co. 5702-30 Natural Bridge Ave., St. Louis 20, Mo.
PIONEER BUILDERS OF LUBRICATING EQUIPMENT FOR A QUARTER CENTURY

fered publicly in the near future to raise additional capital for this venture.

Crescent is aggressively expanding its oil and gas reserves by development drilling and by the purchase of proven properties. Modern financing techniques including oil payments and exchange of company stock and mergers, will be utilized to satisfy the requirements of sellers. In addition, Crescent may make investments in industries unrelated to the oil business.

Through Dr. N. K. Anderson, Crescent will continue to search actively for attractive investment opportunities in the fields of petrochemicals and engineering.

Crescent will continue to headquarter in the Atlas Life Building, Tulsa, Oklahoma.

NOW in your choice of TWO TYPES!

G. P. & F. DOME TOP UTILITY CANS

WELDED BAIL

ALSO WITH RIVETED BAIL

Now, in addition to the riveted bail, you may order famous G. P. & F. Dome Top Utility Cans with a welded bail. Both types are designed for easy carrying, with plenty of "knuckle clearance" over the filler cap. And, of course, both types have the same strong body and double-pour spouts that have made these cans best-sellers from coast to coast.

A SALES BUILDER! CAN BE USED ANYWHERE!

G. P. & F. Dome Top Utility Cans (in solid colors or lithographed with your design) have scores of uses. On the farm, in the garage, in the home, at the lake . . . these containers help your customers . . . build good will for you. In 5-gallon and 40-pound sizes. Write for complete information!

G.P.F.

GEUDER, PAESCHKE & FREY CO.

425 NORTH 15TH STREET • MILWAUKEE 1, WISCONSIN

Telephone Division 4-3000

Oils and Greases Not Important to Atomic Power Plants

Oils and greases will not play an important part as lubricants for moving parts in the water-cooled nuclear section of atomic power plants, according to a paper presented at the recent Diamond Jubilee Semiannual meeting of The American Society of Mechanical Engineers in Boston.

The speaker, Mr. A. Smaardyk, associate engineer, Argonne National Laboratory, Lemont, Illinois, told his audience that organic lubricants react chemically under irradiation and that quantities of lubricant depositing on the fuel elements would impede heat transfer. Such conditions have made it imperative that research find bearing materials that would be compatible using the cooling water as the lubricant. This is required despite the fact that water is not a good lubricant, and introduces a corrosion problem, along with the fact that the temperature of the cooling water ranges from 200 to 500 degrees F.

Mr. Smaardyk described the many tests made on sliding, roller and ball type bearings. On sliding type bearings graphite materials were found to be the only ones suitable for high speeds and loads up to 100 pounds per square inch, provided the journal material was compatible with carbon. Titanium carbide proved superior to other materials when used with carbon.

Initial tests on roller bearings included weedle, tapered roller and special barrel-type rollers. Results were such that tests on these types were discontinued in favor of further work on ball bearings.

According to Mr. Smaardyk, the most troublesome feature on ball bearings were the metallic retainers; they were a constant source of galling and scoring. Thus, tests were conducted without retainers but with spacer balls placed alternately between the load balls, and with micarta, nylon and rubber retainers.

Numerous tables and illustrations presented with the paper compared the results obtained with different bearing metals as well as different types of bearings. But, as would be expected, the load-carrying capacity

of any of the bearings tested using water as a lubricant is only a few per cent of that of a similar oil-lubricated bearing.

Copies of Mr. Smaardyk's paper, No. 55-SA-42, may be obtained at 50 cents each from Order Dept., ASME, 29 W. 39th St., New York 18, N. Y.

Vulcan Constructs Freight Loading Addition

Vulcan Stamping & Mfg. Co., manufacturers of steel shipping pails and drums have now under construction, a new addition to their plant which will allow all railroad freight cars and additional motor trucks to be loaded inside, under cover. The structure is 460 feet in length and will be covered with aluminum and fibre glass. In addition, an overhead crane-way is incorporated in the structural steel, running the full length of the building, to facilitate unloading of steel, raw materials and machinery. Modern, up-to-date lighting fixtures are planned to permit 24 hour loading of freight cars and trucks.

Monsanto's Phosphorus Pentasulfide Now Available

The addition of phosphorus pentasulfide to the list of phosphorus derivatives available from Monsanto Chemical Company's Inorganic Chemicals Division was announced today by Tom K. Smith Jr., divisional director of marketing.

New manufacturing facilities using a unique process have just been completed at the company's Monsanto, Ill., plant for the production of the versatile, highly reactive intermediate. Principal users are manufacturers of tiophosphates for oil and grease additives, ore flotation agents, insecticides and other chemicals. It also can be used as an intermediate in a variety of organic synthesis.

Monsanto's distilled phosphorus pentasulfide, made with pure electric furnace phosphorus, is being marketed as a greenish yellow granular powder. Typical analysis is 27.9 per cent phosphorus, 72.0 per cent sulfur, and a melting point of about 280°C. The P_2S_5 also can be made available in solid form. Powdered material is packed in 150 and 325 pound drums. Further information on the product can be obtained from the Inorganic Chemicals Division, Monsanto Chemical Company, St. Louis 1, Missouri.

ASLE-ASME to Hold 2nd Joint Lubrication Conference

D. F. Wilcock, General Electric Co., Schenectady, N. Y., Conference Committee Chairman, announced that there will be a Joint Lubrication Conference sponsored by the Lubrication Activity Committee of the American Society of Mechanical Engineers, and the American Society of Lubrication Engineers at the Antlers Hotel, Indianapolis, Ind., October 10, 11 and 12, 1955.

There will be 6 sessions covering Bearing Instability, Recent Studies in Hydrodynamic Lubrication, Lubricants, Rolling Element Bearings, Boundary Lubrication. There will be given a total of 28 papers in these six sessions.

This 2nd Joint Lubrication Conference will be open to all members of both ASME, ASLE, and guests. Those interested can get further information on this program by writing D. F. Wilcock, General Electric Co., General Engineering Laboratory, 1 River Road, Schenectady, N. Y., or the American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill.

General Mills to Market Crosby Products

The Chemical Division of General Mills, Inc., and Crosby Chemicals, Inc., announce an arrangement whereby General Mills will market the major portion of a complete line of tall oil fatty acids to be produced by Crosby Chemicals, under General Mills' Aliphat brand. General Mills' Chemical Division will continue to manufacture at Kankakee, Illinois, tallow, soya, cottonseed, coconut, corn and other vegetable fatty acids.

Emery Releases Book On Oleic Acids

Emery Industries, Inc. announces the release of a new 20-page, comprehensive booklet on oleic acid. Titled "Emersol Oleic Acids," this brochure covers the various means of evaluating oleic acids with emphasis on end-product performance. This includes a discussion of the interpretation of analytical tests normally performed on oleic acid, along with a complete description of the line of Emersol oleic acids and the significance of their outstanding stability advantages.

Also included is a section on handling oleic acid, an end-product selection chart, and a series of useful charts on such properties as viscosity, specific gravity, etc.

Copies of this booklet titled "Emersol Oleic Acids" are available upon request from:

Emery Industries, Inc.
Dept. 5, Carew Tower
Cincinnati 2, Ohio

See You at the ANNUAL MEETING

In the early days . . . wherever the old prairie schooner went . . . there was the grease bucket, dangling on the tailgate. Grease plays an even more important part in our economy today. That's why suppliers turn to Deep Rock where they are assured of the highest quality lubricants.

DEEP ROCK OIL
CORPORATION
BOX 1051 PHONE 2-4351
TULSA, OKLAHOMA

Crosby will start producing tall oil fatty acids at their plant at Picayune, Mississippi about April 15th. Their new, modern, up-to-date installation, with large capacity, is especially designed for tall oil fractionation and distillation of fatty acids with extremely low rosin acids content.

The Chemical Division of General Mills will handle the distribution of the complete line of fatty acids, as well as fatty acid derivatives and Polyamide Resin through its District Sales Offices and Sales Representatives. General Mills will carry warehouse stocks throughout the country.

New Catalog Issued by Baker Castor Oil Co.

The Baker Castor Oil Co. announces the issue of their completely new 16 page comprehensive "Catalog and Product Guide of Castor Oils and Chemical Derivatives." The booklet describes the uses and suggested applications of over 90 castor oil products together with their more important physical and chemical properties in an easy-to-read tabular form. General classes of products covered include refined, blown, dehydrated, and hydrogenated castor oils, esters, fatty acids, metallic soaps and specialties. Also included are a list of available technical literature and a series of useful charts on such properties as solubility, compatibility, and viscosity.

Copies of this catalog may be obtained by writing to The Baker Castor Oil Co., Sales Promotion Dept., 120 Broadway, New York 5, N. Y.

NEW LUBRICATION SLOGANS POP UP

"Never Under-Estimate the Importance of Lubrication" says Magie Bros., Inc. in their company slogan. Slogan-conscious Vice President A. J. "Andy" Callaghan suggests in a letter to NLGI President, H. L. Hemmingway, that it could also be effectively used by everyone as "a readable sign on metal or decal."

He believes it should be displayed on: "service stations, automobiles, busses, trucks, tractors, motor cycles, motor boats, electric motors, gas engines, steam engines, pumps, power house locomotives, railroad cars, street cars, coaches, diesel engines and all other pieces of machinery requiring lubrication."

Other slogan uses could be "on all bulletins by each company selling lubricants, in publications and books on subject of lubrication."

Generating new lubrication slogans seems to be taking hold. Here are a few others your *Spokesman* has heard:

Lubricate for Comfort and Safety Every 1,000 Miles

Make It Last—Lubricate First

Make It Last—Lubricate Now

Official slogan for NLGI since the first issue of the *Spokesman* in March, 1937, has been:

Lubricate for Safety Every 1,000 Miles

Throughout the years this has stuck and been used in every issue and elsewhere.

If you have a lubrication slogan you think will out-slogan any used or dreamed up to date–send it to the *Spokesman*.

FISKE BROTHERS REFINING CO.

Established 1870

*

NEWARK, N. J.

TOLEDO, OHIO

*

Manufacturers of

LUBRICATING GREASES

Swift Uses Chicago Port to Unload Norwegian Sperm Oil

Swift & Company's Industrial Oil Department in Hammond, Indiana, recently took delivery on what is believed to be the first cargo of Norwegian sperm oil to be shipped directly from Holland to the Chicago area via the St. Lawrence waterways.

The tanker M. S. NADY of German registry, pumped her cargo of 500 tons of the marine product into Swift tank cars at the Calumet Harbor terminals facilities on June 29. The crude product will be refined at Swift's Hammond Technical Products plant into Sperm Oil and Spermaceti. Swift & Company, a major producer of Sperm Oil products, cites the Norwegian sperm oil as being the most desirable of the crude oils for their use.

The use of the new harbor facilities in Chicago marks the second move in recent months by Swift to gain greater flexibility in their production of Sperm Oil. Facilities to receive and process sperm oil at the Swift plant at Harrison, New Jersey, were announced recently.

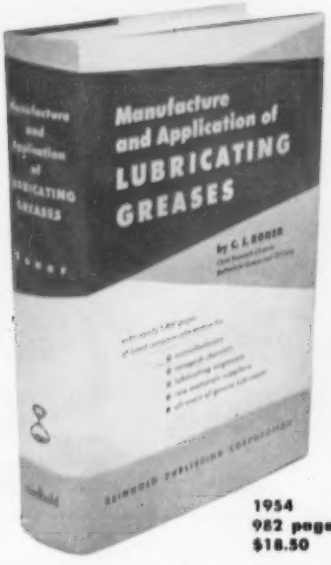
TANKER N. S. WADY UNLOADS IN SWIFT'S CHICAGO PORT

Just Published! . . . . . .

Manufacture and Application of LUBRICATING GREASES

by C. J. Boner

Chief Research Chemist
Battenfeld Grease and Oil Corp.



1954
982 pages
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FACT-FILLED PAGES
IN THESE
23
BIG CHAPTERS

1 Introduction
2 Structure and Theory
3 Additives Other Than Structural Modifiers
4 Raw Materials
5 Manufacturing Processes
6 Equipment for Lubricating Grease Manufacture
7 Aluminum Base Lubricating Greases
8 Barium Base Lubricating Greases
9 Calcium Base Lubricating Greases
10 Lithium Base Lubricating Greases
11 Sodium Base Lubricating Greases
12 Lead Soap Lubricating Greases
13 Strontium Base Lubricating Greases
14 Miscellaneous Metal Soaps as Components of Lubricating Greases
15 Mixed Base Lubricating Greases
16 Complex Soap Lubricating Greases
17 Non-Soap Thickeners for Lubricating Fluids
18 Fillers in Lubricating Greases and Solid Lubricants
19 Residua and Petrolatums as Lubricants
20 Analysis of Lubricating Greases
21 Tests of Lubricating Greases and Their Significance
22 Application of Lubricating Greases
23 Trends in Lubricating Greases

Here in one giant volume . . . the most complete storehouse of information ever published on the composition, properties and uses of lubricating greases!

The book begins by describing in detail the structure and theory of lubricating greases. Then follow chapters on the various raw materials, processes and manufacturing equipment. Lubricants containing specific thickeners, including such recent developments as lithium soaps, complex soaps and non-soap gelling agents, receive special attention.

Of major interest is the large section on present uses and future trends of lubricating grease products. Here you'll find the complete details of when, where, and how to apply a specific lubricant for any given purpose.

Everyone concerned with the preparation or use of grease lubricants will find Boner's book of enormous practical value. Manufacturers and lubricating engineers will find here a complete breakdown of the effects of each ingredient or treatment upon the characteristics of the final product, and a full explanation of the physical and chemical methods used in measuring these characteristics. Suppliers of fats, oils, additives, thickeners and other raw materials will gain new ideas for future product research and development. In addition, users of grease products will learn the properties of available lubricants and the major purposes that each fulfills.

MAIL THIS HANDY ORDER COUPON TODAY!

NLGI SPOKESMAN
4638 J. C. Nichols Parkway
Kansas City 12, Missouri

Please rush me a copy of Boner's MANUFACTURE AND APPLICATION OF LUBRICATING GREASES.

☐ I am enclosing $18.50
☐ Please bill me

NAME _____

ADDRESS _____

_____

CITY & ZONE _____ STATE _____

Recommended Practices . . . Unforeseen Demand Soars Distribution to 91,642 Copies

Last year and for quite some previous years NLGI's 1955 President, H. L. Hemmingway chairmanned a committee determined to write and produce an automotive front wheel lubrication manual. Their objective was to put the mechanic on the beam and his customers out of misery from faulty front wheel lubrication.

They also had in mind the number of complaints about defective lubricating grease that oozed into brakes soon after lubrication. They knew that most complaints came from wrong lubrication. Not wrong grease.

Maybe We'll Distribute 10,000

In October, 1954, just in time for the annual meeting in San Francisco, they finally got it together. About 800 samples were distributed there. Looking it over, some thought we might distribute as many as 10,000. Then there was the wild group who thought 25,000 copies would meet all demands.

Everybody was wrong about it. The Manual was right. Servicemen everywhere read it and reasoned "do it right and no kick-backs, satisfied customers are the steady ones." It took hold everywhere. To date a whopping 91,642 copies have been sold throughout the world. It's been translated into Spanish. A meeting of lubrication technicians in Germany will discuss it and publish their remarks soon.

Lincoln-Mercury Service Manual

The Lincoln-Mercury people read it over and sent a service bulletin describing the Manual to their: district sales managers, service managers, dealer's service managers and mechanics. Here is part of their description:

"LUBRICATIONS SPECIALISTS WHO WISH TO USE THIS BOOKLET AS A GUIDE WILL FIND THAT THE VARIOUS OPERATIONS HAVE BEEN DESCRIBED AND ILLUSTRATED WITH UNUSUAL DETAIL. IT IS RECOMMENDED AS AN EXCELLENT MEDIUM FOR ESTABLISHING STANDARD PROCEDURES IN FRONT WHEEL BEARING LUBRICATION."

. . . and that's the best summary we've heard yet.

SIGN OF
CORRECT
LUBRICATION

Makers and Marketers of
Mobil
Automotive
Oils and Greases
Gargoyle
Industrial
Oils and Greases

SOCONY MOBIL OIL CO., INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

9 grades of Swift's LAREX serve specific lubricating needs

Tallow Fatty Acid #42
Fatty Acid #35 & #86
Hydrogenated Tallow & Marine Glycerides
Hydrogenated Castor Oil
Stearic Acids
Red Oils (Oleic Acid)
Hydrogenated Tallow & Marine Fatty Acids
Lard Oils
Acidless Tallow
Tallows
Sperm Oil

● Yes, we are familiar with the edible uses of pork when the pig goes to market the first time. But a part of Swift's pigs go to market *again* as Larex, to serve many industrial uses such as in cutting oils, fine lubricants and in metal stamping; for sulfurizing, additives, for mold release agents and others.

Just as your products depend on the quality of the raw materials used, lard oils depend on the quality of pork fat used. All of these porkers provide Swift & Company *first choice* from a wide selection of quality raw materials.

To you this means, that when you buy Larex, you can choose from 9 grades to fill the most ordinary . . . or most critical of your lard oil needs.

All of Swift's products, which serve the lubricating industry, are backed by a sales and research organization that, like you, are constantly seeking better, more economical means of producing lighter color, more uniform lubricants.

Swift & Company has specialized in processing a full line of fats and oils for the lubricating industry. Write for the new 8 page bulletin describing the products listed at left and remember . . .

ONE TRIAL IS BETTER THAN A THOUSAND CLAIMS

Swift
CENTENNIAL
1855 1955
TO SERVE INDUSTRY BETTER

USE THIS COUPON FOR FURTHER INFORMATION

Swift & Company, Industrial Oil Dept. O-151
1842 165th Street
Hammond, Indiana

Please send data on the following products:

_____

_____ ☐ Send Industrial Oil Bulletin.

Name _____ *Title* _____

Company _____

Address _____

City _____ *Zone* ___ *State* _____

FUTURE MEETINGS of the Industry

AUGUST, 1955

15 American Petroleum Institute (OIIC Steering Committee meeting), Biltmore Hotel, N. Y., N. Y.

15-17 Society of Automotive Engineers (West Coast meeting), Hotel Multnomah, Portland, Ore.

15-19 American Institute of Electrical Engineers (Pacific general meeting), Butte, Mont.

21-26 National Congress of Petroleum Retailers, Inc. (9th Annual Session), Sheraton-Cadillac Hotel, Detroit, Mich.

30-31 Petroleum Packaging Committee of the Packaging Institute, Royal York and King Edward Hotels, Toronto, Canada

SEPTEMBER, 1955

2-3 Association of Desk and Derrick Clubs of North America, The Commodore Hotel, N. Y.

8-9 American Petroleum Institute (OIIC meeting), Conrad Hilton Hotel, Chicago, Ill.

12-15 Society of Automotive Engineers (tractor meeting), Hotel Schroeder, Milwaukee, Wis.

13-15 National Petroleum Association, Atlantic City, N. J.

14-16 National Petroleum Association (53rd annual meeting), Traymore Hotel, Atlantic City, N. J.

22-23 Mid-Continent Oil & Gas Assn. (La.-Ark. Division annual membership meeting), Roosevelt Hotel, New Orleans, La.

26-27 Independent Oil Compounders Assn. (annual meeting), Hotel Bismarck, Chicago, Ill.

25-28 American Institute of Chemical Engineers, Lake Placid Club, Lake Placid, N. Y.

27-28 Ohio Petroleum Marketers Association Fall Conference and Golf Tournament, Netherland Plaza Hotel and Maketewah Country Club, Cincinnati, Ohio

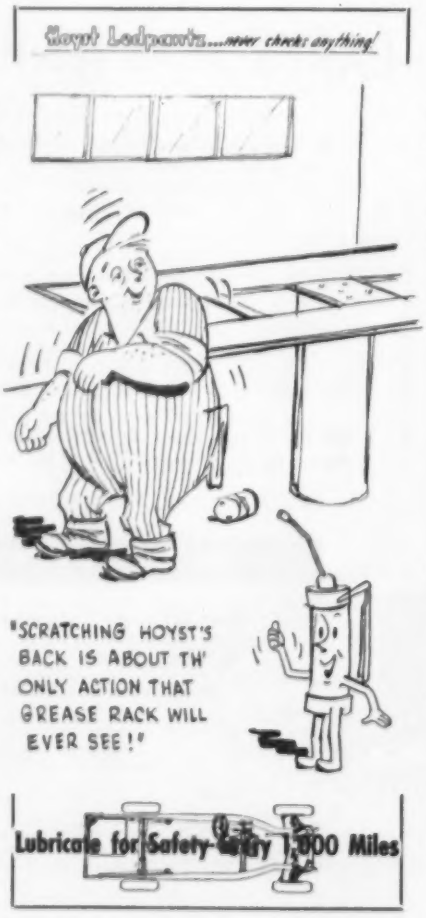
OCTOBER, 1955

2-5 AIME Petroleum Branch (Fall meeting), Roosevelt Hotel, New Orleans, La.

2-6 ASTM Committee D-2, Petroleum Products and Lubricants, Statler Hotel, Washington, D. C.

3-7 American Institute of Electrical Engineers (Fall general meeting), Morrison Hotel, Chicago, Ill.

9-15 American Petroleum Institute Oil Progress Week



"SCRATCHING HOYST'S BACK IS ABOUT TH' ONLY ACTION THAT GREASE RACK WILL EVER SEE!"

11-15 Society of Automotive Engineers, Hotel Statler, Los Angeles, Calif.

12-13 South Dakota Independent Oil Men's Assn., Mitchell, S. D.

18-22 National Safety Council (43rd National Safety Congress and Exposition), Chicago, Ill.

24-26 American Standards Assn. (annual meeting), Sheraton Park Hotel, Washington, D. C.

27-29 Rocky Mountain Oil & Gas Assn. (annual convention), Cosmopolitan Hotel, Denver, Colo.

23-25 National Association of Oil Equipment Jobbers (5th Annual Meeting), Hotel President, Kansas City, Mo.

31 to Nov. 1 Independent Petroleum Assn. of America (annual membership meeting), Jefferson Hotel, St. Louis, Mo.

31 to Nov. 2 NLGI ANNUAL MEETING, EDGEWATER BEACH HOTEL, CHICAGO, ILL.

31 to Nov. 2 Society of Automotive Engineers (transportation meeting), Chase Hotel, St. Louis, Mo.

NOVEMBER, 1955

2-4 Society of Automotive Engineers (diesel engine meeting), Chase Hotel, St. Louis, Mo.

9-10 Society of Automotive Engineers (fuels and lubricants meeting), Bellevue-Stratford Hotel, Philadelphia, Pa.

13-18 American Society of Mechanical Engineers (75th anniversary meeting), Hilton & Blackstone Hotels, Chicago, Ill.

14-17 American Petroleum Institute (35th annual meeting), Mark Hopkins, Fairmont, St. Francis, and Palace Hotels, San Francisco, Calif.

16 American Petroleum Institute (OIIC Steering Committee meeting), San Francisco, Calif.

17 National Industrial Conference Board (general session), Bellevue-Stratford Hotel, Philadelphia, Pa.

27-30 American Institute of Chemical Engineers (annual meeting), Statler Hotel, Detroit, Mich.

DECEMBER, 1955

6-7 Petroleum Packaging Committee of Packaging Institute, Benjamin Franklin Hotel, Philadelphia, Pa.

8-9 American Petroleum Institute (OIIC meeting), Waldorf-Astoria Hotel, New York, N. Y.

11-14 American Society of Agricultural Engineers (Winter meeting), Edgewater Beach Hotel, Chicago, Ill.

JANUARY, 1956

9-13 SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich.

APRIL, 1956

18-20 National Petroleum Association, Cleveland, Ohio

JUNE, 1956

3-8 SAE Summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

SEPTEMBER, 1956

12-14 National Petroleum Association, Atlantic City, N. J.

NOVEMBER, 1956

1-2 SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill.

8-9 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

APRIL, 1957

16-18 National Petroleum Association, Cleveland, Ohio

SEPTEMBER, 1957

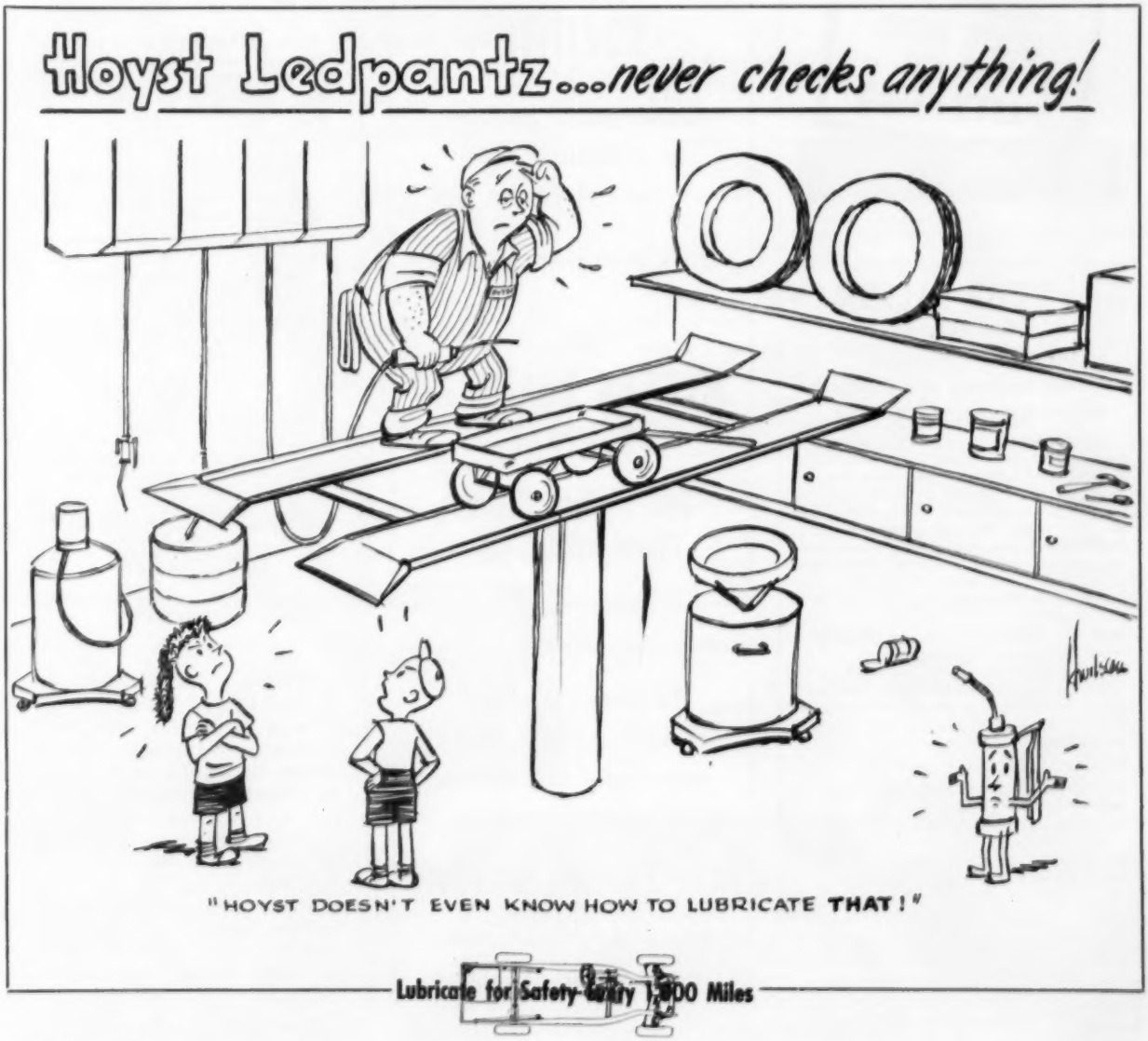
11-13 National Petroleum Association, Atlantic City, N. J.

APRIL, 1958

16-18 National Petroleum Association, Cleveland, Ohio

SEPTEMBER, 1958

10-12 National Petroleum Association, Atlantic City, N. J.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Lubricate for Safety-Every 1,000 Miles

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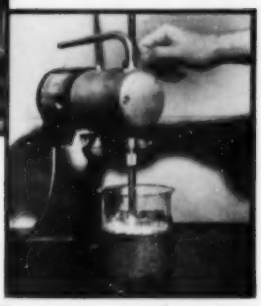
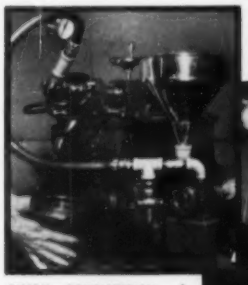
Bentone* 34 Grease

Multi-Tested for a Thousand Uses!

EXACT FORMULATION — various formulas are tested until one is produced that meets all of manufacturer's requirements.



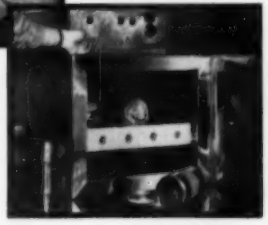
MIXING—mixing prepares formula for milling.



MILLING—milling or homogenizing produces a smooth, consistently uniform grease.

EXACT CONSISTENCY — penetrometer tests indicate consistency or hardness of grease sample and determine the plasticity of the formula.

EXCELLENT MECHANICAL STABILITY — roller tests measure mechanical stability of grease and produce a numerical evaluation — during penetration testing — of the change in consistency caused by kneading or working action of rollers.



HIGH SHEAR STABILITY—shear stability tests exert influence far in excess of any working pressures for which grease will be used.

EVERY DAY Baroid's extensive laboratories assist grease compounders to formulate greases with Bentone* 34 gelling agents. Compounders throughout the country have used Baroid laboratory service to obtain the best formula — using *their* oil and Bentone* 34 — to make a grease that's right for thousands of applications. For the farm . . . automotive industry . . . industrial machinery of every kind — grease made with Bentone* 34 serves a need not met by any other type of lubrication. Its unique composition has a tenacious quality that causes it to adhere to metal . . . has a matchless resistance against rain and washout . . . works well under both *extreme* high and low temperatures! It answers a multitude of lubrication problems because one Bentone grease is good for scores more applications than any known conventional lubricant.

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THE NON-SOAP GELLING AGENT

NATIONAL LEAD COMPANY ★ BAROID DIVISION

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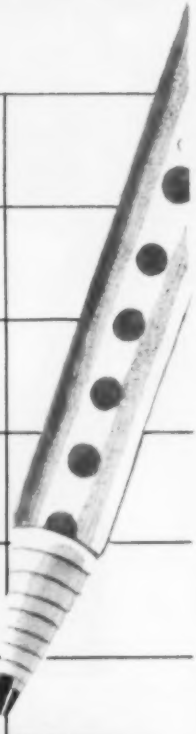
PERFORMANCE CHARACTERISTICS	Inlucite 21	Aluminum Grease	Calcium Grease	Sodium Grease
Mechanical Stability— as measured by life in hours on an accepted Roll Test machine.	Excellent	Poor	Good	Medium
Lubricating Properties— as measured by the number of hours to lubricant failure in an actual oscillating bearing under 500 lb. load.	Excellent	Poor	Medium	Medium
Wheel Bearing Performance— as measured by the U. S. Army Wheel Bearing Tester both at high temperature and in the presence of water.	Excellent	Poor	Poor	Poor
Pumpability— as measured by standard dispensing equipment in a cold room at temperatures down to zero.	Excellent	Poor	Medium	Poor
Multi-Purpose Usage— as measured by actual field experience in applictions on all grease points on cars, trucks and farm machinery.	Excellent	Poor	Poor	Poor



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